PETROLEUM WEEK

JULY 19, 1957

■ A McGRAW-HILL PUBLICATION

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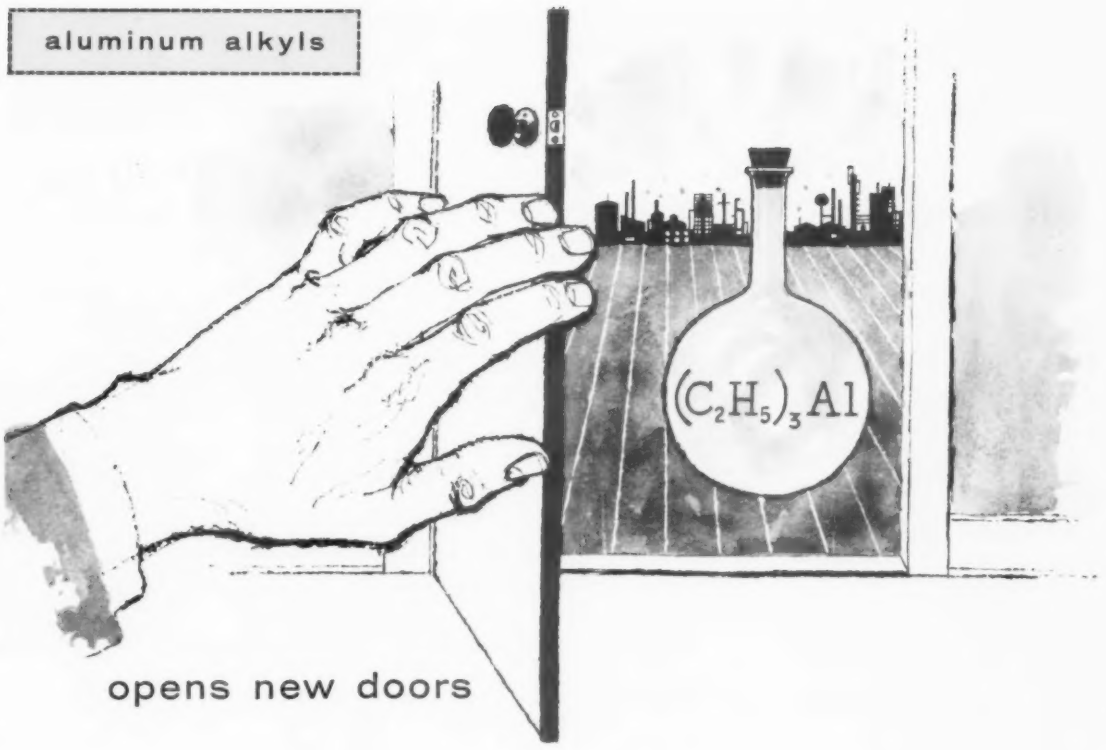

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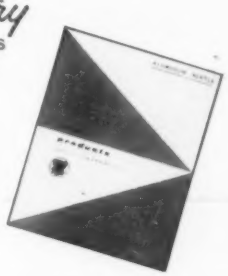

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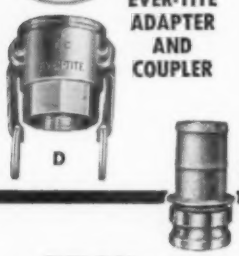

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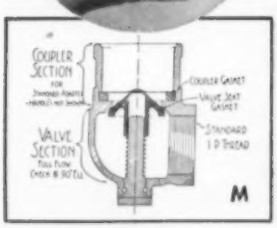

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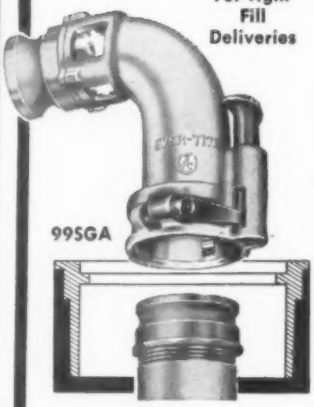

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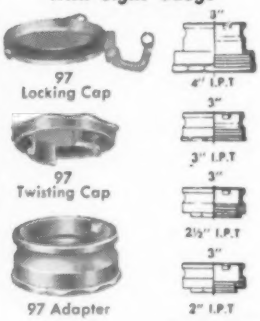

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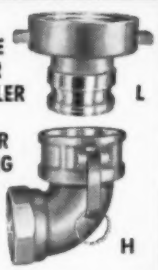

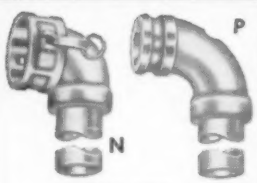

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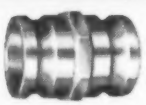

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Vol. 5, No. 3

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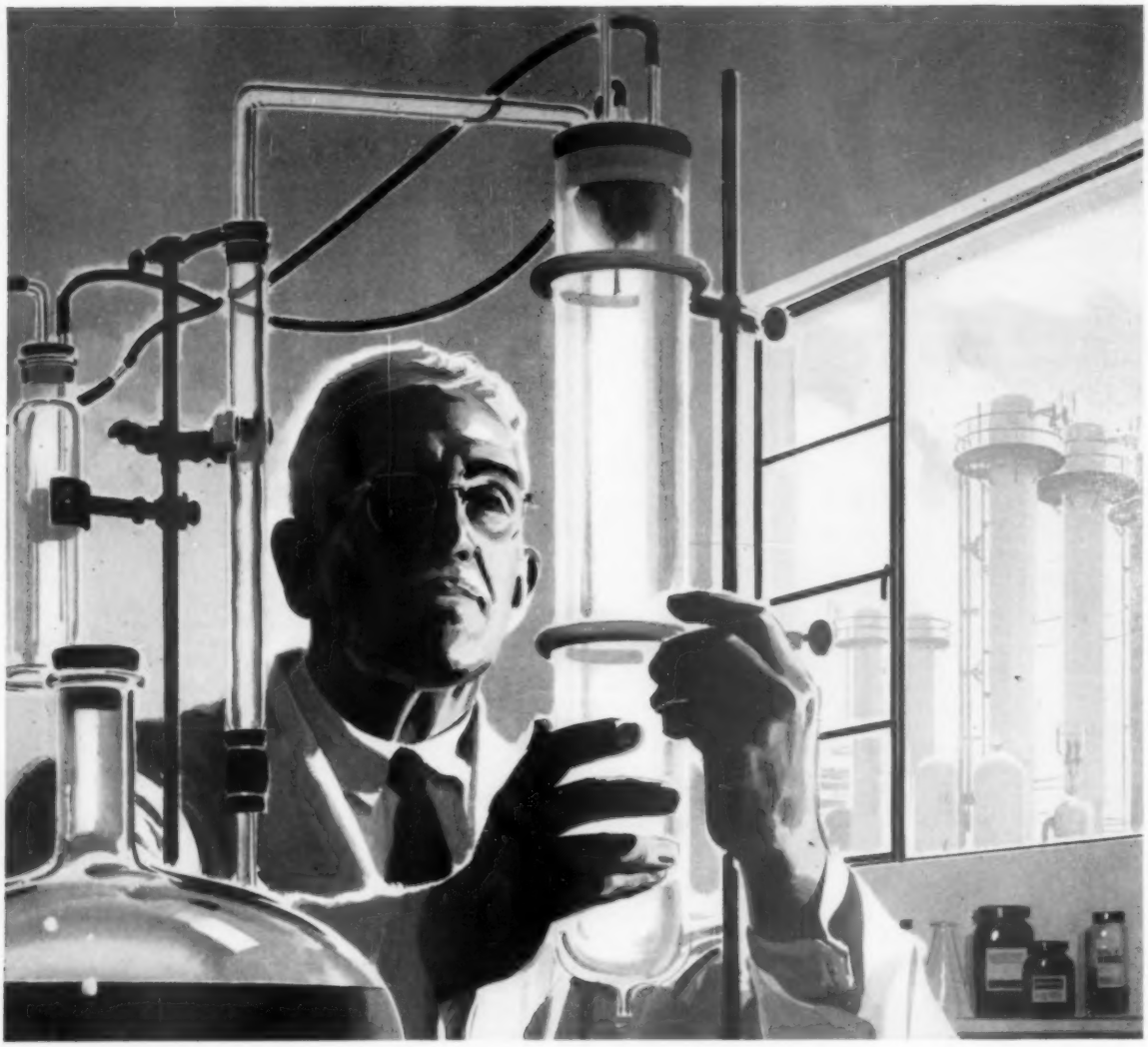

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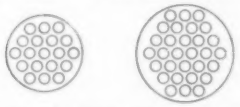
✓ Because Trufin is an extended surface tube—with fins extruded right from the tube wall—it has more than twice the heat transfer surface of plain tube. Less tube is required because Trufin transfers more BTU's per foot of tube.

✓ Fewer tubes mean smaller shells, headers, baffles, etc. This saves material requirements.

✓ Fewer tubes mean fewer holes to drill—less rolling-in operations. Direct result: substantial savings in labor costs.

✓ To transfer a given heat load—when Trufin is used—much less weight of over-all tube metal is required. This is a real saving when expensive alloys are necessary. This is of greatest importance when alloys are in short supply, as a given quantity of metal in Trufin transfers much greater heat loads.



FEWER TUBES
MEANS SMALLER SHELLS

✓ Because of these material savings, lighter units—requiring less structural support—can be designed. This is vital when exchangers are to be mounted on superstructures.

✓ Maintenance costs are low. Costs of replacement tubes are reduced; fewer tubes result in less cleaning time, more "on stream" time. Actual operating data proves that Trufin withstands fouling for longer periods than does prime surface tube. This increases the length of operating time between change-overs.

EQUIVALENT TUBES
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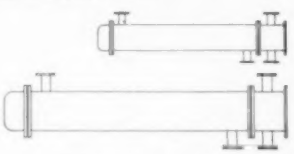
✓ Smaller, lighter units result in easier handling and lower shipping costs.



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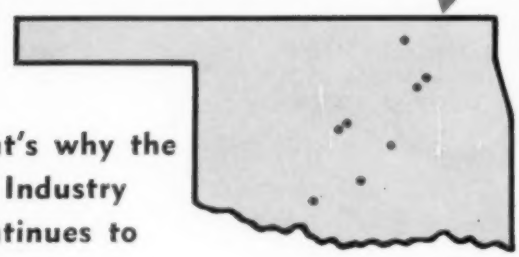

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86 YEARS OF PROGRESS WITH THE OIL INDUSTRY

60-Second Summary / WHAT'S HAPPENING IN OIL

July 19, 1957

dept/INDEX

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A plan for a new natural gas pipeline from Canada to the U.S. is creating a stir. Pacific Gas & Electric Co. says it will build a line from Alberta to San Francisco. This would change the California supply picture, and it is already creating a fresh rush for gas reserves in western Canada. However, there's lots of red tape ahead before the firm can get the necessary U.S. and Canadian approvals. . . . p. 11

•

The oil industry is fighting to cut losses caused by corrosion. A Special Report shows some progress is being made, particularly by use of inhibitors and coatings. . . . p. 31

•

Any imports plan by the Cabinet committee is apt to be only a temporary stopgap. The reason: There is no plan that would satisfy everyone in and out of the oil industry. Dissidents will no doubt carry the battle to Congress. . . . p. 14

•

Universal Oil Products has developed a unique process combining cracking and reforming operations. The company reports good yields of top-quality gasoline and distillates can be obtained from a wide range of charge stocks. . . . p. 62

•

The tempo of wildcatting for the first commercial oil or gas discovery in Oregon and Washington is stepping up. And the outcome of a California Standard test in southeastern Washington may have a major bearing on other prospects in the area. . . . p. 21

•

Petrobras, Brazil's oil monopoly, could be in for trouble at home if a private Brazilian company succeeds in Bolivia. Bolivia will allow only a private firm to develop Brazil's oil rights in Bolivia. And if the venture succeeds, the pressure may mount for competitive development in oil-short Brazil. . . . p. 59

•

The first rig to be designed and built as an all-electric unit has started to work in West Texas. It's drilling a 22,000-ft test, the deepest in the area. . . . p. 25

•

Electronics is moving into oil marketing operations. It will arrive with Esso's new centralized computing center in Baltimore. . . . p. 66

•

Mobile instruments will control the portable pump stations now being installed on Tapline. The unique system will permit the desert line to be run remotely. . . . p. 54

•

The natural gas bill now appears almost certain to pass the House, perhaps in early August. Senate action won't come until 1958. . . . p. 17

Up to the Minute / SIGNIFICANT LATE NEWS

July 19, 1957

The Cabinet committee hopes to reduce crude imports to 1-million b/d. This would be about 200,000 b/d below what importers have scheduled for the second half. The committee's plan, now nearing its final draft, is expected to be a quota system, geared to 10% to 12% of domestic demand. The restrictions probably won't go into effect until in the fourth quarter, to give companies time to adjust plans.

Oil-state congressmen aren't satisfied with the reported solution. But it's too late to make an effective trade fight this year. So they'll see how the plan works, and push for legislation imposing tight restrictions next year if imports continue to be "excessive."

•

A nuclear-powered supertanker is being actively planned in England. Two big firms, John Brown & Co. and the Hawker Siddeley Group, are behind it. And Britain's atomic energy authority and its admiralty are encouraging the move. The tanker, to be at least 65,000 tons, is in the design stage, but no construction start has been set.

•

Another round of downward price adjustment is underway in Southwest Texas, this time for Mirando and Agua Dulce crudes. Sinclair kicked it off with reclassifications of its postings, making a cut of 20¢ a bbl. for Mirando and 10¢ a bbl. for Agua Dulce. Magnolia followed with a 20¢ cut for Mirando crudes, posting $3.21 a bbl. for below 24-gravity and $3.33 a bbl. for above 29-gravity.

Earlier this month, purchasers trimmed Southwest Texas light and heavy crudes, including Refugio, by 5¢ to 18¢ a bbl.

•

Minimum spacing regulations for exploratory tests have been issued for the first time in Louisiana. One aim: to avoid too-dense spacing of wells in new reservoirs before the establishment of units for them, when the drilling of several wells is necessary to get information on finds.

•

The T.U.L.M. group has closed its deal for a 900,000-acre Bolivian concession—the one formerly held by Texas oilman Glenn McCarthy. The group—Tennessee Gas, Union Oil & Gas of Louisiana, Lion Oil, and Murphy Corp.—exercised its option with the Bolivian government for the concession (PW—Jun.14'57,p69). Drilling may start within four months.

•

The Justice Dept. lost the first round in its attempt to prove "overcharging" for Marshall Plan oil. In the first case against the "Caltex group," the New York Federal District Court ruled against the U.S. this week. An appeal is likely. Two other cases are pending, against Jersey Standard and Socony. The three suits were originally filed in 1952.

Congrats and $25 to Samuel J. Martinez, 1830 East 15th St., Tulsa 4, Oklahoma, for this quip.

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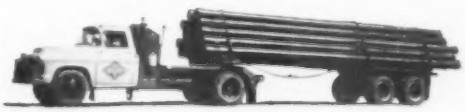

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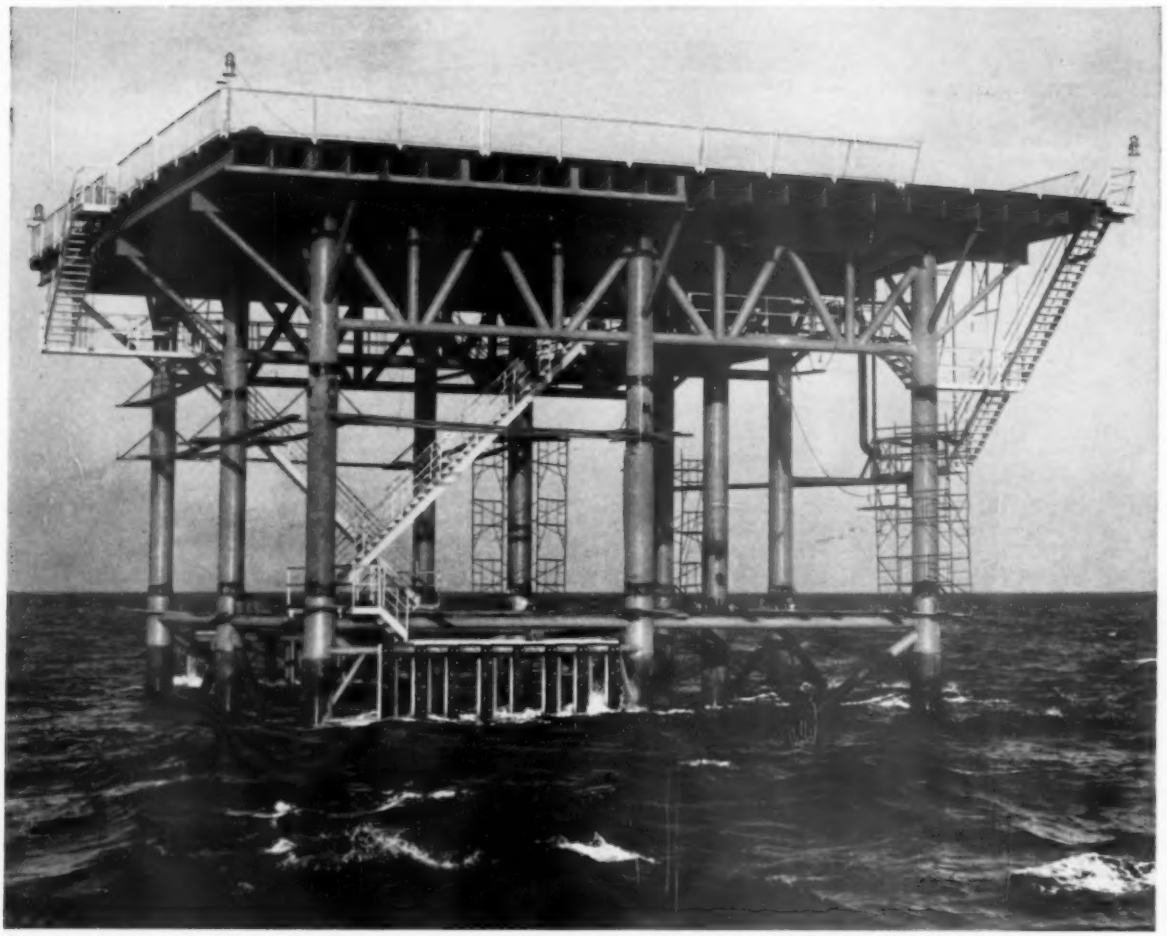

Photo: courtesy Brown & Root Inc.

Coatings based on BAKELITE Vinyl Resins for this off-shore platform of a major oil company were supplied by **Plastic Coating Corporation, Houston, Texas.**

Vinyl resin coatings prove superior for

painting off-shore structures

As one coating manufacturer reports, "After extensive testing, at least 75% of the oil companies operating offshore drilling platforms are beginning to standardize on vinyl-based coatings. It is estimated that these platforms will be in the water about 50 years, so the protection of the steel is of paramount importance."

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More Canadian Gas for U.S. Use?

Pacific Gas & Electric Co., a big West Coast utility firm, wants to build its own gas pipeline from Alberta to the San Francisco area.

It announced plans late last week for a $300-million, 1,300-mi. line.

In the beginning, the 36-in. line would have a capacity of around 350-million to 400-million cu. ft. daily. About half of this would be sold to gas utility companies in southern California.

Currently, Pacific Gas & Electric buys all of its out-of-state gas—about 750-million cu. ft. daily—from El Paso Natural Gas Co. This gas comes from the Four Corners area and from West Texas fields.

Even if the new line is built, Pacific Gas & Electric will continue to buy gas from El Paso Natural.

It plans to expand its tie-in line with El Paso to a capacity of over 1-billion cu. ft. daily.

Thus, the purpose of Pacific Gas & Electric is to obtain its own secondary source of supply in order to reduce its dependency on a single outside source.

Pacific Gas & Electric is the only major natural gas distributor in northern California.

In an area with a population of about 6.5-million, it served 1,311,000 residential gas customers and 111,000 commercial customers in 1956.

On its peak day of gas sales in 1956, the company sold 1.5-million cu. ft. This is greater than the anticipated combined sales of Trans-Canada and Westcoast Transmission in their first few years of operation.

Pacific Gas & Electric figures that it will need an additional supply of 1.5-billion cu. ft. by 1960 to meet its growing demand.

Plans for the new line have already stepped up the scramble for natural gas reserves—particularly in Alberta fields.

Pacific Gas & Electric's president, Norman R. Sutherland, said that a recently-organized Canadian subsidiary of his company has already contracted for "substantial" quantities of gas, and is pushing efforts to buy more.

He said it has cooperative agreements with Canadian Western Natural Gas Co., of Calgary, and with Northwestern Utilities, Ltd., of Edmonton, for purchase, sale, and transmission of gas.

THIS IS THE ROUTE that Pacific Gas & Electric Co.'s proposed Canada-to-U.S. natural gas pipeline would take. The smaller red line denotes the route of another possible project—a pipeline from the Four Corners area to Los Angeles.

Westcoast Transmission Co. has been busy recently seeking to sign up suppliers in Alberta.

Westcoast, whose line ties into the El Paso Natural-Pacific Northwest system at the U.S.-Canadian border, is planning a new line, too.

This line would run from Savanna Creek, in southwestern Alberta, over into British Columbia, to connect with the line from the Peace River fields.

This line would make more Canadian gas available to El Paso Natural's system in the U.S. Proponents of Westcoast's proposal say it would be more feasible for it to build such a tie line—which would be only 175 mi. long—than for Pacific Gas & Electric to build its proposed 1,300-mi. line.

At any rate, Westcoast and Pacific

Gas & Electric are both trying to buy more reserves in Alberta.

This competition for gas supplies appears to be pushing prices there upward. This is a happy change for producers in that region who, not long ago, were wondering whether they would have an outlet.

Some of the purchase offers are as high as 15¢ per thousand cu. ft. for clean gas—the highest price ever offered in the Canadian west. (Trans-Canada was paying around 10¢ before the competition became sharper.)

In addition to competition in lining up supplies, Pacific Gas & Electric faces several other hurdles before its proposed line could become a reality:

- Alberta would have to give permission for the gas to be exported from the province. It would also decide which fields might be "dedicated" to the export plan.
- The new Conservative Canadian government would have to establish a policy on gas exports from Canada.
- The U.S. Federal Power Commission would have to approve the import plan. These steps will require considerable time.

There is likely to be some—but probably not much—opposition in Alberta.

Alberta producers, for the most part, will be happy to have buyers competing for their gas supplies. However, Alberta's two major gas utility companies may raise objections. They want to have readily accessible gas for their own expanding markets in Alberta.

The biggest hurdle may be in Ottawa, where the project is apt to run into politics. The Conservatives took a staunch "Canadians first" stand last year in the red-hot debate over the Trans-Canada pipeline project.

The postelection atmosphere may be calmer, but there is sure to be some vigorous protest over any plan to export more of Canada's natural resources.

The Canadian government is certain to want to make long and careful studies to be sure there will be enough gas to supply Canada's future needs before it will permit added exports.

If the project is approved in Canada, it stands a pretty good chance of being approved in the U.S. by FPC.

The FPC policy now is to permit imports of supplementary supplies (but not sole supplies).

Some Washington observers feel that FPC would be pleased to grant permission for another line to the West Coast. In doing so, they feel, FPC would avoid the charge that it has permitted El Paso Natural to gain a dominating position in that region.

The real fight over a policy on gas imports from Canada took place when several companies were competing for FPC authorization to build a line to serve the Pacific Northwest.

The fight finally narrowed down to two proposals. One would have used San Juan Basin fields as the source of supply, while the other would have brought in Canadian gas.

As it was finally worked out, Canadian gas was permitted to supplement the domestic source.

Construction of the Northwest project is well along now, with deliveries of gas due to begin late this fall.

Even with a precedent established, Pacific Gas & Electric faces considerable red tape before it can hope to get all the needed clearances.

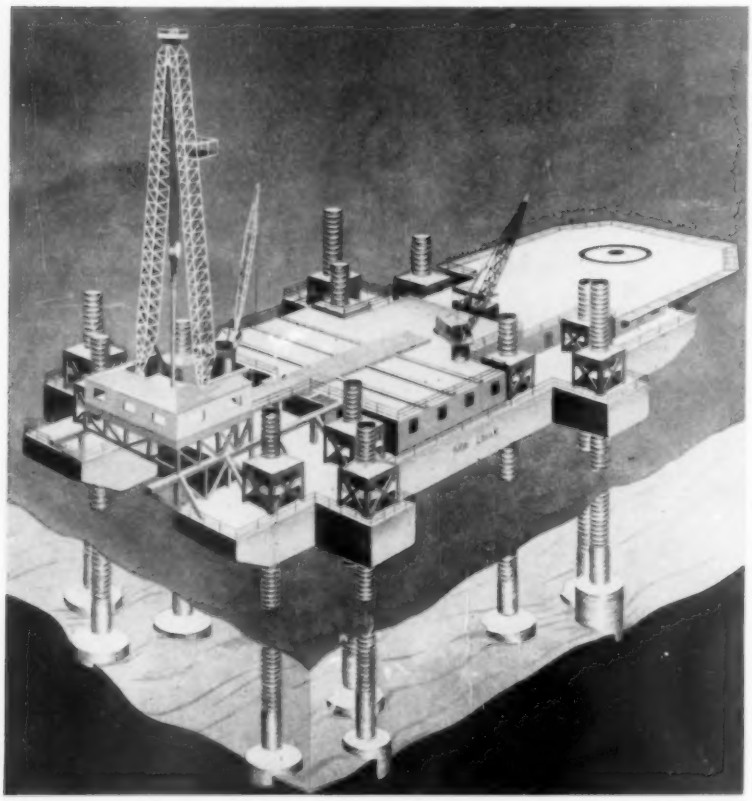
If the line is built, plans call for Bechtel Corp. to do the designing, engineering, and construction. Blythe & Co. would help in the financing.

The system would cross several mountain ranges, cutting through portions of British Columbia, Idaho, Washington, Oregon, and northern California. It would terminate at the existing Pacific Gas & Electric station at Antioch, not far from San Francisco. It would take approximately two years to build.

Meanwhile, other suppliers are also eyeing the growing California market.

There was a recent disclosure that the newly-formed Trans-Western Pipe Line Co. intends to build a gas line from the Four Corners area to California.

The firm, established by Warren Petroleum, Monterey Oil, and J. B. Butler, a Houston consulting engineer, plans to run the line to the California border, reportedly for sale to an industrial customer in California.



Contracts Let for New Offshore Barge

Universal Drilling Co., of New Orleans, is planning to build a fleet of deep-water offshore drilling barges. Contracts have been let for the first one.

The new barge is designed to operate in 120 ft. of water, with the possibility of going to 200 ft. by the addition of longer caissons.

The first barge, Mr. Louie, is to be delivered in December or January. Port Houston Iron Works will build it.

The cost: around $3-million.

It's a Big World

Unusual Is Usual In Oil Operations

The oil industry, big and widespread, gets involved in a myriad of off-beat activities. This can include painting a storage tank to resemble a world globe, or it might involve a unique "fishing" expedition, a wheelless truck, or a mid-summer job requiring a heavy fur coat and mittens.

FULL OF GAS, this storage tank near Savannah, Ga., has become the world's largest globe, mapped to scale.

THIS MAY LOOK FISHY, but it's a new method used by California Research Corp. to gauge a river's flow.

KEEP COOL, as a Swiss fuel-truck driver (left) and a testing lab technician (right) are doing here.

WILL TRAVEL ANYWHERE. That's the claim for this truck, which is equipped with soft air "bags" instead of conventional wheels and tires.

How Long Will a New Import Plan Last?

The industry expects the cabinet committee proposals to provide at best a short-term solution.

Regardless of what imports "control" plan comes from the President's special cabinet committee it will be a temporary stop-gap at best, rather than a long-range solution.

That is the growing belief in the oil industry, with the committee's recommendations expected to be made to the President soon.

There are many reasons for such a belief:

• For one thing, the committee is pretty much hemmed in by the Eisenhower Administration's reluctance to make a major hike in tariffs or to install a government-controlled quota system.

So far, the Administration has been opposed to any moves that would tend to place significant restrictions on trade with friendly nations.

• And for another thing, any plan that gets Administration approval won't please all in the industry or numerous nonindustry groups. This will bring immediate pressure for revisions.

Basically, importing companies are against any government-controlled quotas or higher tariffs. They continue to argue that voluntary restrictions are sufficient to control imports—regardless of the performance so far to the contrary. Domestic independents, on the other hand, will continue to demand specific controls on imports—through either sharply higher tariffs or federal-controlled quotas.

And congressmen from the big oil-consuming states are against any form of restrictions on imports that might bring higher-priced petroleum products for their constituents. There is also powerful support for unrestricted imports by jobber groups.

Actually, a new "control" plan at this time will probably serve only to tide the problem over until Congress meets again next year. At that time, it is likely the battle will be joined for a showdown fight on imports in general, and oil imports in particular.

Any long-range imports plan bumps into complex international, as well as domestic, problems.

Any controls that would curtail imports from Venezuela and Canada will hit two nearby nations that are major buyers in the U.S.

On the other hand, if a control plan were to be adopted to discriminate against the Middle East and not curtail the flow from Canada and Venezuela, then even greater problems of peaceful relations with Arab nations might be created.

The disagreement within the industry on solution of the imports problem can be readily seen. For, as the cabinet committee nears the time for its recommendation, a wide variety of "control plans" are being offered. None of them would be totally acceptable to all branches of the industry.

The most recent plan is one suggested by the Texas Independent Producers & Royalty Owners Assn. It would place a sliding-scale tariff, ranging up to $1.35 a bbl., on all "excessive" imports.

TIPRO's definition of excessive imports are above the level recommended by the cabinet committee in 1955. It decided over-all imports should be held to 16.6% of U.S. crude oil production—the 1954 relationship.

TIPRO's plan would permit imports up to 16.6% of domestic production to enter at existing duties. The duty on crude is 10½¢ a bbl.

But for all imports in excess of that level, the tariffs would be sharply higher. Imports between 16.6% and 20% of domestic production would carry a duty of 60¢ a bbl.; those between 21% and 25%, 75¢ a bbl.; those between 26% and 30%, 90¢ a bbl.; those between 31% and 35%, $1.05 a bbl.; and those above 35% would be taxed at $1.35 a bbl.

TIPRO is not alone in pressing for higher tariffs. There is a growing demand for an increase in tariffs on imports despite the reluctance of the Eisenhower Administration to raise duties.

One imports tariff proposal would encourage the construction of a Venezuela-U.S. crude pipeline.

An official of one importing company told PETROLEUM WEEK this week that tariff control is the most realistic method of limiting imports.

Another tariff plan that has been discussed would provide for higher tariffs on imports, but would exempt oil entering the U.S. by pipeline.

Such a proposal is aimed at pleasing some congressmen, particular those from the upper Midwest, who are strongly opposed to any restrictions on imports from Canada—the only exporter to the U.S. via pipeline.

And while a pipeline import "exemption" would apply only to Canadian oil at present, there is some possibility that other Western Hemisphere oil may eventually enter the U.S. via pipeline.

There has been some talk in the industry of a possible pipeline from Venezuela, skirting around the northern fringe of South America, up through Central America and Mexico, and then into the U.S. (map).

The total length of such a line would be about 2,500 mi., or about 1,000 mi. longer than an "ocean" route from Venezuela to the U.S. Gulf. The latter has been ruled out, however, because of the engineering problems of laying a line at the depths that would be encountered.

Such a Western Hemisphere line is only in the "talking" stage—there have been no engineering studies.

While import "plans" proposing higher tariffs predominate, many domestic producers still favor a rigid quota limitation.

Numerous plans have been offered, limiting imports to various percentages of refinery capacity or to import volumes in a previous year.

One recent quota plan, proposed by Texas Gulf Producing Co., would restrict total imports to 15% of domestic demand. And crude imports would be limited to 9.5% of domestic demand. The permitted import volumes for crude and products would be established quarterly from the Bureau of Mines' forecasts of demand.

The imports quota would be divided among the four big consuming areas—East Coast, Gulf Coast, Pacific Coast, and mid-U.S.

Each area would get a quota based on its percentage of 1956 imports.

Refiners in each area would be as-

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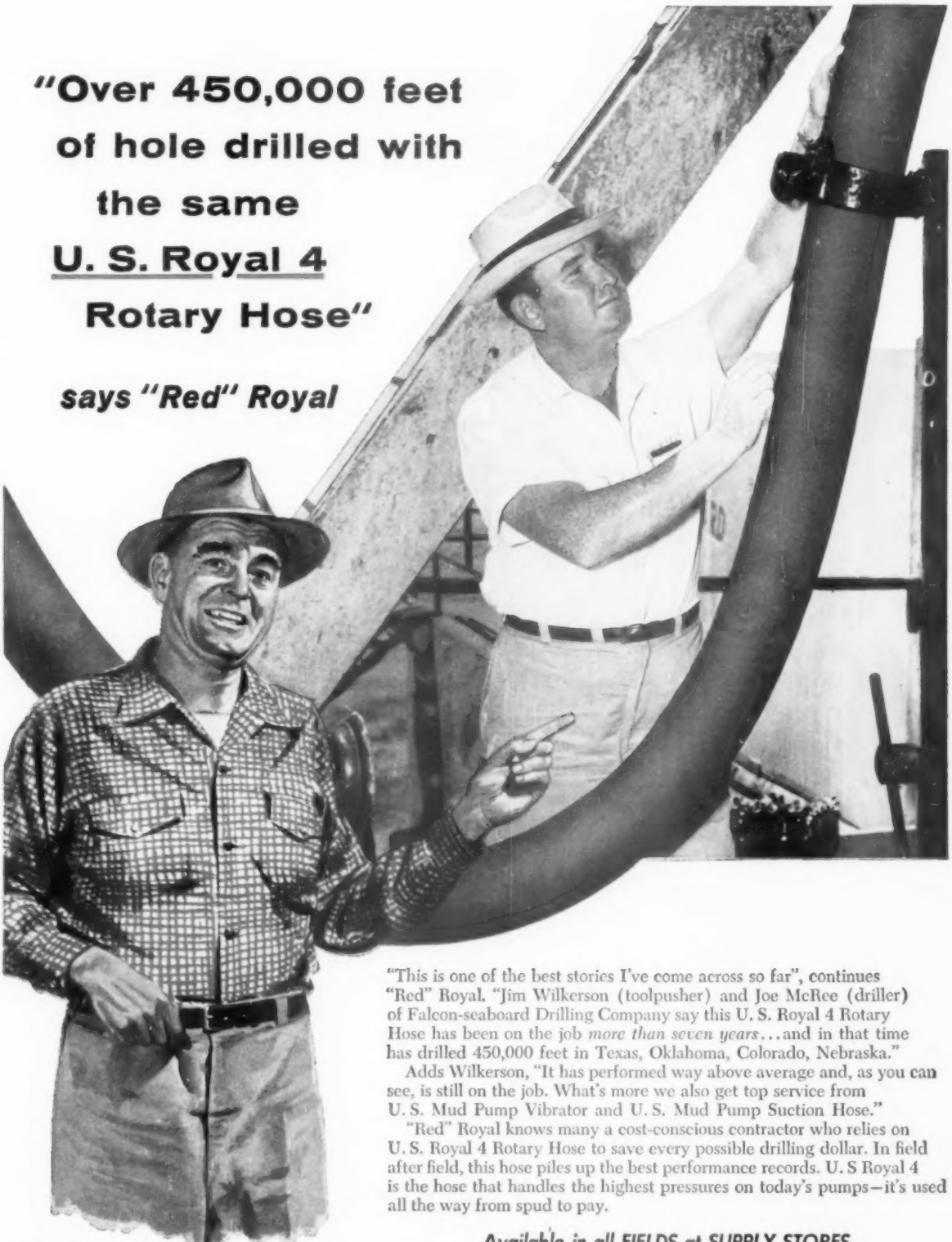

"This is one of the best stories I've come across so far", continues "Red" Royal. "Jim Wilkerson (toolpusher) and Joe McRee (driller) of Falcon-seaboard Drilling Company say this U. S. Royal 4 Rotary Hose has been on the job *more than seven years*...and in that time has drilled 450,000 feet in Texas, Oklahoma, Colorado, Nebraska."

Adds Wilkerson, "It has performed way above average and, as you can see, is still on the job. What's more we also get top service from U. S. Mud Pump Vibrator and U. S. Mud Pump Suction Hose."

"Red" Royal knows many a cost-conscious contractor who relies on U. S. Royal 4 Rotary Hose to save every possible drilling dollar. In field after field, this hose piles up the best performance records. U. S Royal 4 is the hose that handles the highest pressures on today's pumps—it's used all the way from spud to pay.

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signed an "allowable" based on each refiner's percentage of the 1956 imports in each district. New importers would be given certificates only as domestic demand increased.

An unusual form of quota control that would penalize importers with shut-in domestic production was proposed recently by a prominent geologist.

The plan would require each importer to shut in one barrel of domestic production for each barrel imported. The shut-in allocation would be administered by state regulatory commissions, with only supervisory help from the federal government.

After the shut-in allocation was decided, any more domestic production needed to fill demand would be produced by independent companies.

Such a plan, it is claimed would aid domestic producers and would build a reserve producing capacity.

What's New / IN THE INDUSTRY

Lawsuit Is Commenced To Define 'Commence'

The Texas Supreme Court has agreed to decide what "to commence" a well means on an oil and gas lease.

Webster's New International Dictionary (second edition) defines commence as a transitive verb meaning: "To enter upon; to begin; initiate; to perform the first act of; as *to commence a lawsuit.*"

And in the particular case a long lawsuit was commenced to determine what "commence" means as applied to drilling a well.

The Fort Worth Court of Civil Appeals, in a 2 to 1 decision, that has now been appealed to the highest state court, affirmed a trial judge's decision that Wesley Kothman and others failed to fulfill the terms of a lease when they redrilled two abandoned holes in Jack County, deepened one, and found gas in commercial quantities in both.

Kothman contended that they complied with the terms of a lease contract with L. E. Boley and others to "commence" a well to the Ellenburger pay within 60 days. It was a one-year primary term lease.

Associate Justice Ben W. Boyd of the Appeals Court noted that there was no authoritative precedent on the question.

"But it is our opinion that the appellants did not commence a well as they were obligated to by the leases," he wrote. ". . . Nothing can be commenced which has already been started."

Chief Justice Frank A. Massey dissented. "Drilling to a deeper level, as was performed at the north well," he said, "would be 'commencement' in accord with provisions of the contract."

Kothman's attorneys described the appeals court decision as "startling" and "harsh," since it meant that "although two wells were completed, none was commenced."

•

The Federal Power Commission has authorized Southern Natural Gas Co. to build pipeline facilities costing about $7.6-million to connect its transmission system to gas fields in three Louisiana coastal parishes.

FPC also granted certificates to Gulf, Kerr-McGee, Magnolia, Phillips, and Tidewater to sell gas to Southern.

•

Louisiana is trying to get other Gulf Coast states to join it in presenting a united front to the U.S. Supreme Court on the offshore issue.

The court has asked the states to file briefs within 60 days from June 24, outlining their offshore claims.

This week Louisiana called a meeting of the attorneys general of Texas, Mississippi, Alabama, Florida, and Louisiana in an effort to get concerted action by the five states.

Although no conclusions were reached, it appeared very likely that Texas, in particular, would prefer to present its views to the court separately.

•

Phillips Petroleum Co. has successfully tested a wildcat in the Gulf of Mexico that flowed at the rate of 672 b/d through small choke.

The well, No. A-2 Shark, is on a full-interest 5,000-acre federal lease block in the Eugene Island area, 40 mi. off St. Mary Parish, La.

The test was from 40 ft. of perforations in a Miocene pay zone from 8,663-724 ft. The test indicated a gas-oil ratio of 700-1.

•

California's controversial sliding-scale offshore royalties law will become effective Sept. 11.

The new law, known as the Miller Bill (PW—Jun.21'57,p21), was signed by Gov. Goodwin Knight last week. It sets minimum royalty at 16⅔% for offshore lands with the maximum to be determined by bidding.

•

Standard Oil Co. (Ohio) has filed an $856,000 damage suit in Federal District Court in Cleveland charging the Oil, Chemical & Atomic Workers with violating the Taft-Hartley Law by secondary picketing of a refinery construction project.

The suit named both the international union and its Toledo local for picketing a construction project at Sohio's Toledo refinery. All five of Sohio's refineries have been closed by strikes of OCAW locals since early June.

Make It Very Dry

A well is being drilled in Nevada which everyone, even the backer, hopes will be dry.

Hagestad Drilling Co., Bakersfield, Calif., sent its No. 1 rig, a Continental-Emsco 350, to Mercury, Nev., to drill for the Atomic Energy Commission.

The rig will drill a 3,500-ft. hole, which reportedly will be used to evaluate effects of nuclear explosions on water sands and other subsurface formations.

After completion, AEC reportedly plans to explode a nuclear device in an underground tunnel, and then use the 3,500-ft. hole as an observation post to check the effects on the subsurface strata.

Now Big Sikorsky S-58s Speed Offshore Operations

OPERATING EASE—The versatile Sikorsky S-58, shown above, is widely used by airlines and military services. The S-58 and its smaller sister, the S-55, provide maximum maneuverability in pinpoint landings on offshore rigs or tenders.

Rugged, fast-flying Sikorsky S-58 helicopters, able to carry twelve passengers and their baggage, are the latest Sikorsky helicopters in offshore oil transportation service. They carry more men farther and faster than any helicopters in commercial operation.

Now in regular service in the Gulf of Mexico and other areas, the S-58 equipped with floats can fly 125 miles offshore and return without refueling. It cruises at more than 90 miles per hour, making trips in only minutes which would take hours by surface craft. The S-58 is the industry's most advanced offshore transport.

The new S-58 and its companion, the widely-used S-55, each month are air-lifting more than 20,000 crewmen and specialists in the Gulf of Mexico area alone. Sikorsky helicopters are earning their way in the oil industry, proving invaluable offshore as they have in many other operations all over the world where surface transportation is inadequate.

For more information on Sikorsky helicopters, telephone or write Lee S. Johnson, general manager, Sikorsky Aircraft.

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Looking Ahead in Washington

McGraw-Hill
Washington
Bureau
July 19, 1957

The natural gas bill is virtually certain to pass the House, perhaps the first week in August. The Rules Committee, which must clear all legislation for floor action, is evenly split on the measure—on the surface. But Democratic leaders have talked one opposition member—a key Democrat—into abstaining on the vote. And Republican leaders have persuaded a consumer-state GOP member to support the measure. Once through the Rules Committee, proponents believe, the bill will be approved on the floor—but by a small margin. Senate action must wait until next year, however.

•

The Pentagon is working to adapt chemical fuels to manned aircraft. A boron-based fuel said to give 40% more power than conventional jet fuel already has been developed. The Navy also plans development work on a hydrogen peroxide fuel. Goal of the military is to build an engine that will burn either the chemical fuels or regular petroleum fuels. Then the "exotic" fuels can be used for "specific purposes" requiring long range. Speeds are not substantially affected. Pentagon experts doubt that the chemical fuels will ever replace petroleum fuels for routine flights, because of the cost factor.

•

Don't expect any legislation to develop from Kefauver's price study, although it may generate ammunition against the oil and other industries. The Senate antitrust subcommittee's investigation of "administered pricing" industries—those where prices don't quickly react to changes in supply and demand—began last week. Oil companies may not be called for testimony, since oil prices were covered to some extent in the group's investigation of the European oil lift. But committee sources predict oil will be hit in the ultimate report.

•

A serious threat to the National Petroleum Council is evaporating. The House passed the Fascell bill, aimed at imposing tighter controls on NPC and other government advisory groups. But a provision requiring government chairmen was modified to require only that a federal official be present at all meetings. Even the watered-down version is exciting little support in the Senate Government Operations Committee, where it has been referred. No action is contemplated before next year—and possibly not then.

•

A final decision is a long way off in the big midwestern gas case— unless a compromise settlement develops. The Federal Power Commission is under heavy political pressure to speed up its decision on Midwestern Gas Transmission Co.'s proposal to bring Canadian gas into the Upper Midwest. But industry sources speculate that it will be next May before the ponderous procedural requirements can all be met.

•

A huge Alaska area may be opened to oil leasing soon. Secretary of the Interior Fred Seaton says he'll decide soon whether to revoke Public Land Order 82, which had prohibited oil development of 25-million acres in northern Alaska, bordering on naval Petroleum Reserve No. 4. Speculation is that the area will be opened.

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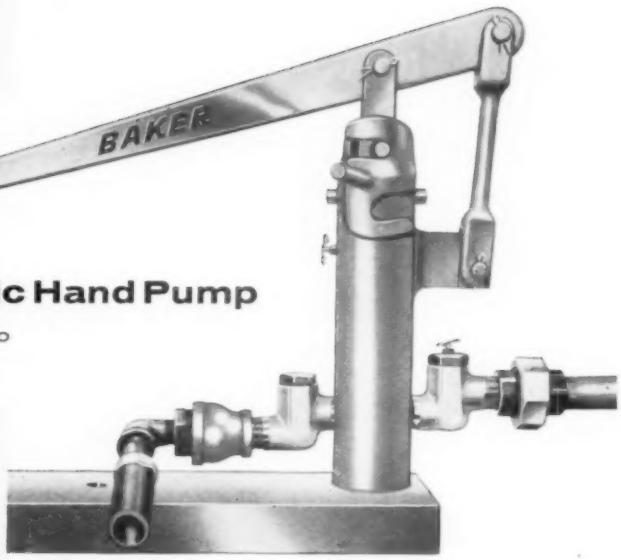

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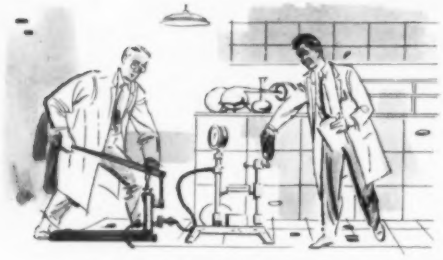

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Still Trying in the Pacific Northwest

Biggest question in the Pacific Northwest today is this: Will current wildcat drilling find the long-sought oil or gas discovery for Oregon or Washington?

Wildcatters are putting on the heat to find an answer to the question. Drilling, which has been building up for the past few years, is now at a peak in the two states.

A possible answer to the question may be a Standard Oil Co. of California test in Washington's Rattlesnake Hills. The outcome might have considerable bearing on other prospects in southeastern Washington.

Standard is moving in to make a stand at No. 1 Rattlesnake Hills Unit, section 15-11n-24e, Benton County, about 15 mi. north of the town of Prosser, Wash. (map). The test will be drilled to a depth of about 8,000 ft. to evaluate prospective oil and gas sands. The drilling site is at the summit of Rattlesnake Mountain. A Standard exploration crew has readied a drilling site there, after completing an access road. Workmen already have developed a water supply and have installed two 15,000-gal. water tanks at the site. Miracle & Wooster Drilling Co. will drill the test.

Company spokesmen stress the fact that the well is a highly speculative and costly venture in an area where little is known of the subsurface. It is known, however, that drilling will encounter a thick layer of Columbian basalt which covers the area. It was unofficially reported that Standard would spend from $500,000 to $1-million on the Benton County project.

Encouraging results from the well, however, would justify the financial risks taken, by favorably affecting projects throughout a large part of southeastern Washington.

Standard holds close to 50,000 acres in the area. Others with blocks in Benton County and Yakima County to the west, include Shell Oil Co., The Texas Co., Richfield Oil Corp., and Ohio Oil Co.

The new wildcat will be the tenth in a series that has cost Standard more than $5.5-million in the Pacific Northwest.

The company's first wildcat was drilled 36 years ago near Moclips, Grays Harbor County, on the Washington coast. Subsequent wells tested geologic structures in the vicinity of Pacific Beach, Ferndale, Alderwood, Lake Carney, Chehalis, Astoria, Prineville, Sequim, and Condon, in both Washington and Oregon.

Most recent of the series was Standard's No. 1 Kirkpatrick, section 6-4s-21e, in the Condon area, Gilliam County, Oregon, approximately 100 mi. southeast of the new Washington wildcat. It was abandoned late in June at 8,726 ft.

Other centers of activity in Washington are the Enumclaw area of King County, below Seattle, and the Copalis Beach area, Greys Harbor County, on the Pacific Coast.

In King County, McCulloch Oil Exploration Co. of California, Inc., drilled two tests of the Kummer anticline, about 30 mi. southeast of Seattle. Both were dry. The tests were a joint venture with Gene Reid Drilling, Inc., of Bakersfield, Calif., and Sunland Refining Corp., of Fresno, Calif., on an approximately 4,000-acre block.

McCulloch's first test—No. 1 Pasquier, section 34-21n-6e—was abandoned at 6,023 ft., after logging gas shows which tested wet. At least five previous wildcats drilled by other operators in the area had been credited with oil or gas shows.

McCulloch then moved about 1,500 ft. southeast of the abandoned wildcat to spud in No. 2 Pasquier on the same section. The operator cored oil-stained sand of "excellent porosity and permeability," but no commercial quantities of oil were found, and the test was abandoned at 4,326 ft.

McCulloch will re-evaluate its Washington projects before doing any further drilling, and may farm out its leases.

In the Copalis Beach area, about

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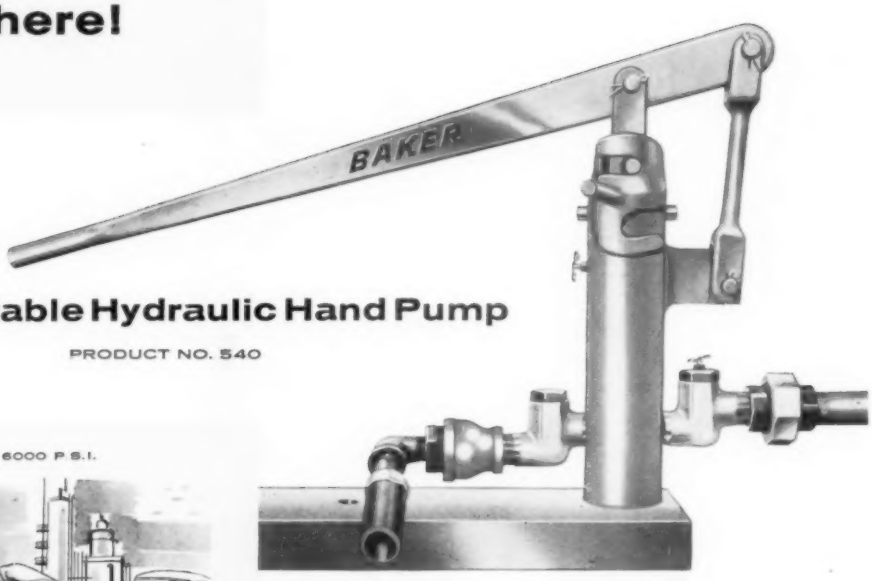

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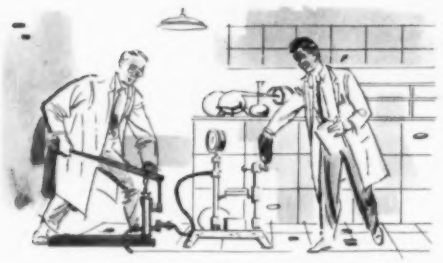

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PRACTICAL PORTABILITY—Weighs only 73 pounds, is small enough to be carried through manholes or into restricted quarters, or to remote or confined areas for spot testing.

DEPENDABLE, ECONOMICAL PERFORMANCE—from the stainless high-pressure piston to the tough, oil-resistant Multi-V Buna N packing units, Baker Hand Pump is made of quality materials. Long lasting, efficient performance is assured with the use of either water or oil as the pressure medium.

MANY OTHER APPLICATIONS—In addition to testing, the Baker Hydraulic Hand Pump has been adapted for use as a hydraulic jack, a pipe or frame straightener, a hydraulic press, and as an actuator for hydraulically controlled valves and hydraulically operated systems.

Saves space • saves weight • performs multiple tasks—costs only a fraction as much as elaborate testing equipment.

BAKER OIL TOOLS, INC.

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Still Trying in the Pacific Northwest

Biggest question in the Pacific Northwest today is this: Will current wildcat drilling find the long-sought oil or gas discovery for Oregon or Washington?

Wildcatters are putting on the heat to find an answer to the question. Drilling, which has been building up for the past few years, is now at a peak in the two states.

A possible answer to the question may be a Standard Oil Co. of California test in Washington's Rattlesnake Hills. The outcome might have considerable bearing on other prospects in southeastern Washington.

Standard is moving in to make a stand at No. 1 Rattlesnake Hills Unit, section 15-11n-24e, Benton County, about 15 mi. north of the town of Prosser, Wash. (map). The test will be drilled to a depth of about 8,000 ft. to evaluate prospective oil and gas sands. The drilling site is at the summit of Rattlesnake Mountain. A Standard exploration crew has readied a drilling site there, after completing an access road. Workmen already have developed a water supply and have installed two 15,000-gal. water tanks at the site. Miracle & Wooster Drilling Co. will drill the test.

Company spokesmen stress the fact that the well is a highly speculative and costly venture in an area where little is known of the subsurface. It is known, however, that drilling will encounter a thick layer of Columbian basalt which covers the area. It was unofficially reported that Standard would spend from $500,000 to $1-million on the Benton County project.

Encouraging results from the well, however, would justify the financial risks taken, by favorably affecting projects throughout a large part of southeastern Washington.

Standard holds close to 50,000 acres in the area. Others with blocks in Benton County and Yakima County to the west, include Shell Oil Co., The Texas Co., Richfield Oil Corp., and Ohio Oil Co.

The new wildcat will be the tenth in a series that has cost Standard more than $5.5-million in the Pacific Northwest.

The company's first wildcat was drilled 36 years ago near Moclips, Grays Harbor County, on the Washington coast. Subsequent wells tested geologic structures in the vicinity of Pacific Beach, Ferndale, Alderwood, Lake Carney, Chehalis, Astoria, Prineville, Sequim, and Condon, in both Washington and Oregon.

Most recent of the series was Standard's No. 1 Kirkpatrick, section 6-4s-21e, in the Condon area, Gilliam County, Oregon, approximately 100 mi. southeast of the new Washington wildcat. It was abandoned late in June at 8,726 ft.

Other centers of activity in Washington are the Enumclaw area of King County, below Seattle, and the Copalis Beach area, Greys Harbor County, on the Pacific Coast.

In King County, McCulloch Oil Exploration Co. of California, Inc., drilled two tests of the Kummer anticline, about 30 mi. southeast of Seattle. Both were dry. The tests were a joint venture with Gene Reid Drilling, Inc., of Bakersfield, Calif., and Sunland Refining Corp., of Fresno, Calif., on an approximately 4,000-acre block.

McCulloch's first test—No. 1 Pasquier, section 34-21n-6e—was abandoned at 6,023 ft., after logging gas shows which tested wet. At least five previous wildcats drilled by other operators in the area had been credited with oil or gas shows.

McCulloch then moved about 1,500 ft. southeast of the abandoned wildcat to spud in No. 2 Pasquier on the same section. The operator cored oil-stained sand of "excellent porosity and permeability," but no commercial quantities of oil were found, and the test was abandoned at 4,326 ft.

McCulloch will re-evaluate its Washington projects before doing any further drilling, and may farm out its leases.

In the Copalis Beach area, about

20 mi. northwest of Aberdeen, Utah Consolidated Oil Co. cemented 5½-in. casing at 4,357 ft. at No. 22-1 Swanson, section 22-18n-12w, preparatory to testing. Drilling contractor is I. W. Love.

Another test by the same operator on the same section—No. 22-1 Hogan—was suspended recently after encountering minor shows.

Another wildcat is slated for drilling in the same area. Sunshine Mining Co., of Spokane, Wash., plans to drill No. 1 Medina in section 15-18n-12w.

Newcomers are carrying the ball in Oregon. General Petroleum Corp. has spudded a wildcat in Douglas County, and Sunray Mid-Continent Oil Co. and Lloyd Corp. will drill a test in Multnomah County.

General Petroleum is making its first start in Oregon with No. 1 Long-Bell, section 27-20s-10w, about 12 mi. northeast of Reedsport, Douglas County. Green & Heiser Drilling Co. moved a rig capable of going to 9,000 ft. with 4½-in. drill pipe from California's Sacramento Valley to Oregon for the drilling job.

In the Holbrook area of Multnomah County, Ore., Sunray and Lloyd are waiting on rig to spud in No. 1 Kappler, section 12-2n-2w. The rig is being moved to the Sunray-Lloyd well from McCulloch's abandoned No. 2 Pasquier. The projected 5,000-ft. test is on a jointly owned 11,000-acre block west of the Columbia River, about 20 mi. northwest of Portland. It represents the first attempt by either company to develop production in the Pacific Northwest.

As a prelude to the test, an extensive nine-well core hole program was conducted in the area last fall. Colorado Wyoming Drilling Co. has the drilling contract.

Other companies are also active in Oregon.

Humble Oil & Refining Co. has been active in the Bend, Klamath Falls, and Lakeview areas of central and southern Oregon, where the company is keeping several gravity meter crews busy.

In Polk County, Miriam Oil Co. spudded No. 2 Walter and Arthur Bliven, section 10-8s-5w. At last reports, the wildcat was still at a shallow depth.

In Jefferson County, Central Oils, Inc., a newly-incorporated company headed by A. R. Morris, announced plans to take over Northwest Oils, Inc., No. 1 Morrow Brothers, section 18-12s-15e. The wildcat has been idle for almost two years.

Drilling Extends Boundary Lake Field

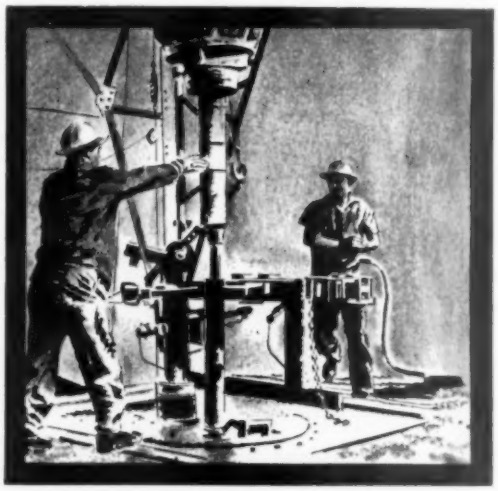
Current drilling in British Columbia's Boundary Lake field has extended the producing limits of the field to about 20,000 acres.

Boundary Lake is 500 mi. above the U.S.-Canada border, close to the Alberta line.

Imperial Oil Ltd. and Pacific Petroleums Ltd. are unofficially reported to have obtained the eighth commercial Triassic producer in the field. On a 5-mi. stepout, the crew found oil at No. 1-23 Alces, and set casing to 4,511 ft. after drilling to 4,516 ft.

Imperial and Pacific are now drilling two follow-up tests, located 1 mi. each way from the stepout. The field is one of the most active areas for new exploration in British Columbia (PW—May3'57,p24).

The eight producers drilled so far are believed to produce from a dolomitic section 250-75 ft. below the top of the Triassic formation. Production potentials range up to 250 b/d of 30- to 34-gravity oil. Three dry holes limit the field to the north, but no limitations have been indicated yet in any other direction.



TWO MILES DOWN—

that's where performance really pays off—and where MD Barite Engineering Service pays its biggest dividends. Whatever the depth, the recommendation of your MD Field Service Engineer can help you log more hole at less cost. He's an expert on drilling problems and drilling mud. His recommendations can mean real savings in casing, prevention of caving and longer tool life. What's more, he can provide you with barite of consistently high quality any time of the day or night from strategically located distribution points.

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Adomite® gives least fluid loss at bottom hole conditions

Many fracturing additives show desired fluid loss control at surface conditions of low pressure and atmospheric temperature. But at bottom hole conditions, fluid loss becomes so high that effectiveness is lost. Fluid loss control tests demonstrate how effective and profitable Adomite is downhole—in marked contrast with other fluid loss additives.

Compare the deep-down effectiveness of Adomite with other loss control additives

	Fluid Loss at Surface Conditions – 100 psi,* 75° F., cc/30 min.	Fluid Loss at Bottom Hole Conditions – 1000 psi, 150° F., cc/30 min.
ADOMITE + crude oil	**2.2**	**22.0**
Additive X + crude oil	**37.8**	**Infinite**
Additive Y + crude oil	**8.5**	**Infinite**
Additive Z + crude oil	**13.0**	**295 (1 min., 50 sec.)**

*(Standard API Code 29 Test)

Adomite, when mixed with oil, disintegrates into millions of tiny particles. These particles seal the face of the formation and keep the fracturing fluid from filtering in. Temporarily sealing the formation, Adomite particles do not plug it.

Additives X, Y and Z contain small sealing particles, too. As temperatures increase, however, their particles soften or dissolve. Thus, the effect in controlling fluid loss is greatly reduced, especially at high pressures prevalent under bottom hole conditions.

Straight lease crude, gelled crude or refined oil, treated with Adomite, gives effective fluid loss control at bottom hole temperatures and pressures.

Producers who say Adomite . . . stay with Adomite.

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Tell your service company to

fracture with Adomite

Giant All-Electric Rig Begins First Jo

UNIT 1220-E draw works shown with J. I. Dooley (left) Rig 44 supervisor, and J. D. Mosley, day driller, is rated at 2,000 hp.

TWO OF THREE MUD PUMPS used on Rig 44 are Continental-Emsco D-700 models. A third pump is a D-300 model.

ENGINE SKID and generator is one of three in main power plant—six Cummins turbodiesels and three generators.

DOG HOUSE will be headquarters for specially-trained crews. Another power unit gets final adjustments in the background.

TRUCK CONVOY hauls Rig 44 components from Great Western Drilling Co.'s Odessa (Tex.) yards to the Pecos County drilling site (map, page 25). The rig was moved 125 mi. and set up in less than two days, compared to the usual eight or ten days.

rst Job—A 22,000-ft. Record Breaker

Maximum portability for a deep-well drilling rig is achieved by the all-electric unit just unveiled by Great Western Drilling Co., of Midland, Tex.

Great Western Rig No. 44 is unique in that it was designed and built as an all-electric rig, in which electric motors are integral with the draw works, pumps, and rotary table.

It is also the first rig specifically designed for West Texas drilling in which converted locomotive-type generators and electric motor equipment are used.

There are many integral diesel-electric units presently in service, but none of these were designed as completely electric units. Many of them were "do-it-yourself" affairs, assembled to meet the conditions of particular situations.

The 2,000-hp. Rig. No. 44 is one of the biggest electric rigs ever assembled. But it does not have as much generative capacity as some electric rigs now on the market.

Rig No. 44 was assembled in Great Western's Odessa (Tex.) shop. Rig components were loaded onto trucks July 7 and hauled to a drilling site in West Texas, where they were assembled in less than two days.

The entire unit was carted in 25 trailer trucks, which averaged about 25 mi. per hour in hauling the unit to its drilling site, about 125 mi. away.

The speed in assembly (the major components were ready within 24 hours; the hydraulic lines took another couple days) means big savings for the drilling contractor, since he can lose as much as $1,500 a day while the rig is idle. It usually takes 8 to 10 days for such rig-ups.

Rig No. 4 already has started on its first job—drilling the deepest test in West Texas. The test is scheduled to go to 22,000 ft.

Phillips Petroleum Co. and Sinclair Oil & Gas Co. No. 1-A Montgomery, section 17, block 134, T & STL survey, Pecos County, will be only 570 ft. short of the world's deepest well—the Richardson & Bass et al No. 1-L Humble-L.L.&E., near Port Sulphur, La. This well is now producing from 20,741-45 ft.

J. I. DOOLEY and H. C. JONES, of Great Western, attended a special GE school to learn the basics of electric rigs.

Deepest test drilled so far in Texas is Magnolia Petroleum Co.'s No. 417-A West Ranch, Jackson County, which was dry at 19,060 ft.

In West Texas, the deepest test ever drilled is Gulf Oil Corp. No. 1 P. G. Northrup, Reeves County, which was abandoned recently at 18,709 ft. This test had been carried to 18,771 ft. in sidetracked hole (PW—Jun.7 '57,p22).

Unit Rig & Equipment Co., of Tulsa, supplied the U-1220-E draw works, which is powered by two General Electric 752-H shunt-wound motors.

The motors are rated at 625 hp. continuous, or 1,000 hp. intermittent service required during hoisting.

The catheads and electrical-control panel were installed on the stock-model rig by Great Western.

The Unit rig is equipped with the Baylor brake. This brake incorporates iron filings in the brake drums. When braking action is desired, an electrical current is introduced that sets up resistance between the drums, thus slowing down the draw works. The Unit rig also has a regular auxiliary brake.

In the main power plant, six Cummins turbocharged diesel engines are connected to three generators.

The Cummins LRT-600 turbodiesel engines have a maximum rating of 450 hp. each at 1,100 rpm. This is the first time this type of engine has been connected to a generator for diesel-electric drilling.

The three GE 752K generators supply power to four GE 752H shunt-wound motors, two of which are connected directly to the draw works.

Any one of the three generators can be used on the rotary table. The remaining two are used to drive the mud pumps.

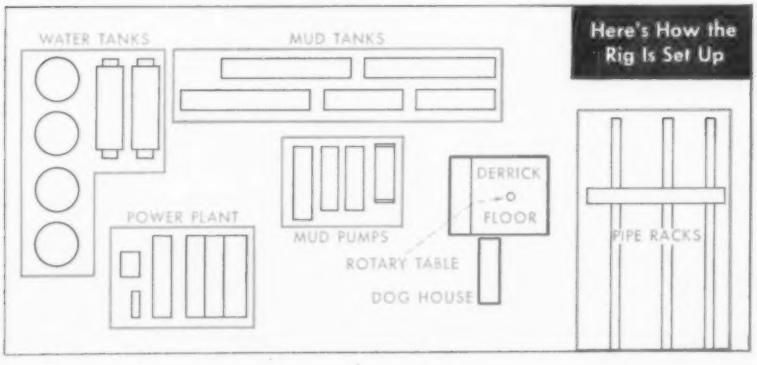
In case of engine failure, one engine driving into the generator can be switched to the draw works to drive the rotary table, leaving full available power for the other two generators, so that the hydraulic system will not be affected during engine repair.

The rotary table is a 27½-in. Unit, equipped with a special pin-type drive.

The Cummins engines are mounted two to a generator, with one engine on each side.

The mud-pumping system—involving three Continental-Emsco pumps—has about twice the storage capacity normally found on a rig of this type.

The mud pits consist of five steel



tanks, three of them 50 ft. long, the other two 30 ft. long.

Two Continental-Emsco D-700 pumps, with 700 hp. input, are powered by a GE 752H motor. The third pump is a Continental-Emsco D-300, which is powered with two Cummins NHRIS diesel engines.

Water storage consists of six 500-bbl. steel tanks.

The L. C. Moore derrick has 1,046,000 lb. capacity.

It is 136 ft. high, with a 36-ft. base. The girder-type substructure is 21½ ft. on floor level, with a capacity of 1.4-million lb.

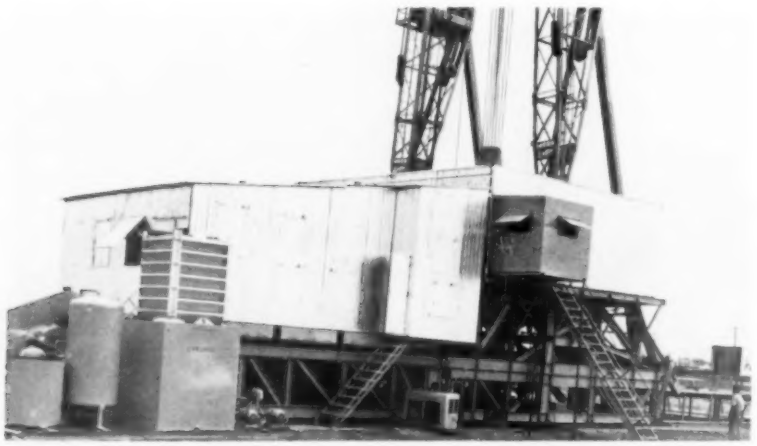
Crews for the new all-electric rig have been hand-picked and specially trained.

Great Western's H. C. Jones and J. Dooley were among 37 oil men from 19 companies that attended the Oil Well Drilling Rig Equipment School held by GE at its Locomotive & Car Equipment Dept., in Erie, Pa., on Feb. 19 and 20, this year.

Rig No. 44 is the end result of the growing demand for integral electric units. As such, it has all the advantages of such rigs for deep-well drilling.

Some of the major advantages claimed for electric rigs are:

- Speed and economy of operation.
- High inherent efficiency of electric transmission.
- Ease of operation and fast response of electric power.
- Lower maintenance, generally, because of smooth power flow, fewer moving parts, and standardized parts.
- Control flexibility, which permits engine-generator sets to be assigned from one rig load to another to meet changing power requirements.
- Remote location of components, which removes any weight-distribution problems for barge installations.
- Easy operation from convenient control panels.
- Elimination of alignment problems, because motors are permanently connected to the driven assemblies.
- Elimination of engine noise and vibration.



COOL DRILLING in North Africa's heat will be possible for Mobil's crews because . . .

This Rig is Air-Conditioned

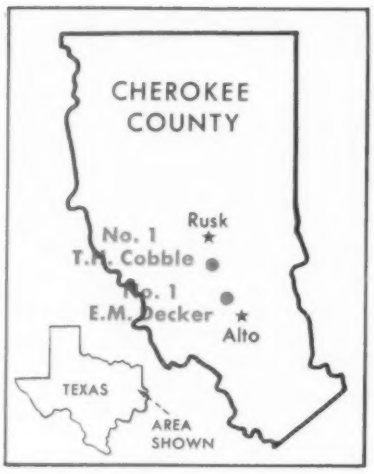
This air-conditioned drilling rig—reportedly the first of its kind—is being built by S & R Tool & Supply Co., Houston, for use overseas.

The rig was built for Camdrill International, Inc., for use by Mobil Oil Co. of Canada in the deserts of North Africa, where temperatures range up to 130F.

About 20,000 cu. ft. of rig space will be air-conditioned. Cool spots will be the engine house, with 10,000 cu. ft. of space, and the drilling floor. They will be cooled by six evaporative-type units employing water from a well which will be drilled in the desert. The units will displace 33,000 cu. ft. of 80F air per minute.

Before being sent abroad, the rig will be run through a series of tests simulating actual operating conditions in the field, with the exception of drilling a hole in the ground.

In addition to the air-conditioning system, the rig is also equipped with a National 110 draw works, an Oilwell rotary drive unit, and an Ideco 143-ft. full-view mast.



Woodbine Sand Draws Cherokee Wildcatters

Cherokee County, once called the "graveyard" for East Texas wildcatters, continues to defy the title as sustained exploration turns up new Woodbine sand pay spots.

In the past month, one such discovery has been made, and another is in sight. Right now, seven wildcats are drilling in the county. Six are heading for the favored Woodbine sand, and one for a deeper formation.

Broken with faults and other anomalies, Cherokee is a wildcatter's hunting ground despite a limiting success ratio. Prior drilling has left a wealth of subsurface information. Broken lease ownership and comparatively cheap drilling provide an incentive for further attempts.

Most attractive to drillers is the Woodbine sand, with its good yield of choice crude and its long payout. Cherokee has numerous Woodbine pools, all relatively small in area but, in most cases, good "money-makers." One such find can cover the cost of many misses, a fact which keeps drilling activity lively.

Columbian Fuel Corp., Houston, has Cherokee's latest discovery completion in the new South Rusk pool, 5 mi. south of the town after which it was named. No. 1 T. H. Cobble, Milton Burns survey, flowed 123 b/d through ¼-in. choke from 5,151-55 ft. Columbian is now drilling a confirmation.

Several miles south of the Columbian discovery, and 4 mi. northwest of Alto, B. G. Byers, of Tyler, is completing another pool opener. No. 1 E. M. Decker, N. Cranshaw survey, flowed 8 bbl. of oil in a one-hour test after swabbing, from 5,285-88 ft.

new OIL from old data!

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And it's a fact . . . for with IBM electronic equipment, the massive details that lie buried in your files are quickly selected, stored and put to work to reveal new production possibilities!

Problems involving reservoir calculations, exploration and parameter variations are solved quickly and accurately. Experiments in production techniques are carried on mathematically and all possible variables tested. Past performance is integrated with new facts to help management determine which of many production methods will *inject new life into old fields.*

Part of the story is, of course, the ability of electronics to handle this complex mass of data accurately and swiftly. But an important reason why *so many companies are turning to IBM* is the extreme versatility of available equipment. For example, a large midwest oil producer installed an IBM 650 for payroll and accounting. And *within one month,* it was using the 650 for lengthy engineering calculations. In fact, this engineering work now takes a major share of machine time.

For more facts, just call your local IBM representative, or write: PETROLEUM DEPARTMENT A57, International Business Machines Corporation, 590 Madison Avenue, New York 22, New York.

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What's New / IN EXPLORATION, DRILLING, PRODUCTION

Huge Canadian Acreage Opened for Exploration

Canadian Husky Oil, Ltd., has acquired federal government permits covering more than 4.7-million acres in the Yukon and Northwest Territories, where extensive search for oil will be carried out in five separate blocks.

Canadian Husky's net interest covers more than 3.3-million acres. The rest is owned jointly with Canadian Superior Oil Co. of California.

Sun Oil Co. has taken out two oil exploration permits on nearly 100,000 acres of crown land in southern Manitoba. Exploration work is expected to begin shortly.

•

Properties Change Hands

Standard Oil Co. of California has "bought in" on deep rights at North Tejon, Kern County, Calif., site of a new field discovery last March by Reserve Oil & Gas Co.

Reserve sold Standard 50% interest in the Vedder zone, which produced 32-gravity oil at a 240 b/d average from 11,850-12,225 ft. in the discovery well. The deal involved 2,000 acres in the discovery area. Reserve retained full interest in the discovery well and its 40-acre site.

Cornucopia Gold Mines, Inc., has purchased Stearns Petroleum, Inc., of Russell, Kan. Stearns owns interest in 29 producing oil wells, and has 16,000 acres of undeveloped leases in Kansas and Colorado. The purchase involved an exchange of stock, and payment of $175,000 by Cornucopia.

Andrew M. Howsley and Charles E. Jacobs, of Albany, Tex., have purchased 23 producing wells on the Nail Ranch, 15 mi. northwest of Albany, Shackelford County, West Central Texas.

Sellers were B. C. McMordie, of Albany, and Riley G. Maxwell, Edgar Davis, and A. J. Frazier, of Abilene. Purchase price was reported to be $750,000. The wells are on 880 acres of leases, and produce approximately 250 b/d from the shallow Cook sand.

Producing Properties, Inc., of Dallas, has bought an undivided fractional interest in 12 wells located in the "fairway" of the East Texas field from National Oil & Grease Co., Penworth Oil Producing Co., and Mrs. Sara R. Hulsey.

The total transaction involved approximately $1.5-million. The properties were bought for $600,000 cash, subject to a reserved oil payment of $900,000. The purchase will add an estimated 1.8-million bbl. to the companys' reserves.

KLB Oil Associates, directed by James Kiel, of Wichita Falls, Tex., has sold to Cataract Mining Corp., Phoenix, Ariz., producing properties in the Jo-Kiel field, Eastland County, Central Texas.

Associated with Kiel were Guy Lombardo, orchestra leader, and his brothers, Carmen and Lebert Lombardo. Purchase price of the properties was $1.5-million.

The Jo-Kiel holdings include ten oil wells and one gas well, plus undeveloped acreage. Cataract also acquired about 500 lease acres in Wichita County, North Texas.

•

Indian Lease Sales Set

The Navajo and Ute Mountain Indian tribes have offered 22,400 acres of tribal lands in northern San Juan County, N. M., for lease at a sealed-bid sale at Gallup, N. M., Aug. 8.

The acreage, in 11 unsurveyed tracts, is in a solid block northwest of the Verde-Gallup pool. There has been no drilling done on the block being offered, nor within 2½-mi of its boundaries.

The Crow Indian Agency has offered 2,267 acres of reservation lands in Treasure and Big Horn Counties, Mont., for lease at a sealed-bid sale July 31.

Acreage offered is primarily in south central Montana, where there has been increased exploratory interest recently. Tracts offered range from 120 acres to 160 acres in size.

Bids on approximately 262 acres of oil, gas, and mineral leases on the Chitimache Indian Reservation, St. Mary Parish, La., will be opened July 25, by the Bureau of Indian Affairs, in Philadelphia, Miss.

The Texas Railroad Commission's order requiring ratable taking of gas in the Puckett (Ellenburger) field, Pecos County, West Texas, has been appealed.

The appeal, submitted to the Texas Supreme Court by Permian Basin Pipeline Co. and Phillips Petroleum Co., challenges the constitutionality of the common purchaser act, as applied to Puckett field.

•

A group of Washington County (Ala.), landowners have waived a 40-acre spacing regulation and have agreed to a precedent-setting 160-acre drilling pattern for a deep wildcat test just north of Citronelle, Mobile County.

Everett Eaves, of Shreveport, La., and Seneca Development Co., of Dallas, are planning to drill a 12,000-ft. test of the Rodessa sand, the producing formation at Citronelle.

They asked approval for the well at a state Oil & Gas Board meeting this week.

The larger spacing pattern was made possible by a legislative act passed last year, which provided that 160-acre spacing could be used if property owners voluntarily unitized their land for that purpose.

•

Sheridan A. Thompson, of Dallas, and George S. Buchanan, of Cody, Wyo., have been nominated for the post of president of the American Assn. of Petroleum Geologists.

Thompson is exploration vice-president of Magnolia Petroleum Co.; Buchanan is production vice-president of Husky Oil Co.

Election will be by mail ballot, with new officers to take over on Mar. 13, at the close of the AAPG annual convention in Los Angeles.

•

The State Bar of Texas is seeking a bill to exempt oil and gas leases from regulation as "securities."

The bar has asked Gov. Price Daniel to submit the bill to the legislature at a special session in October.

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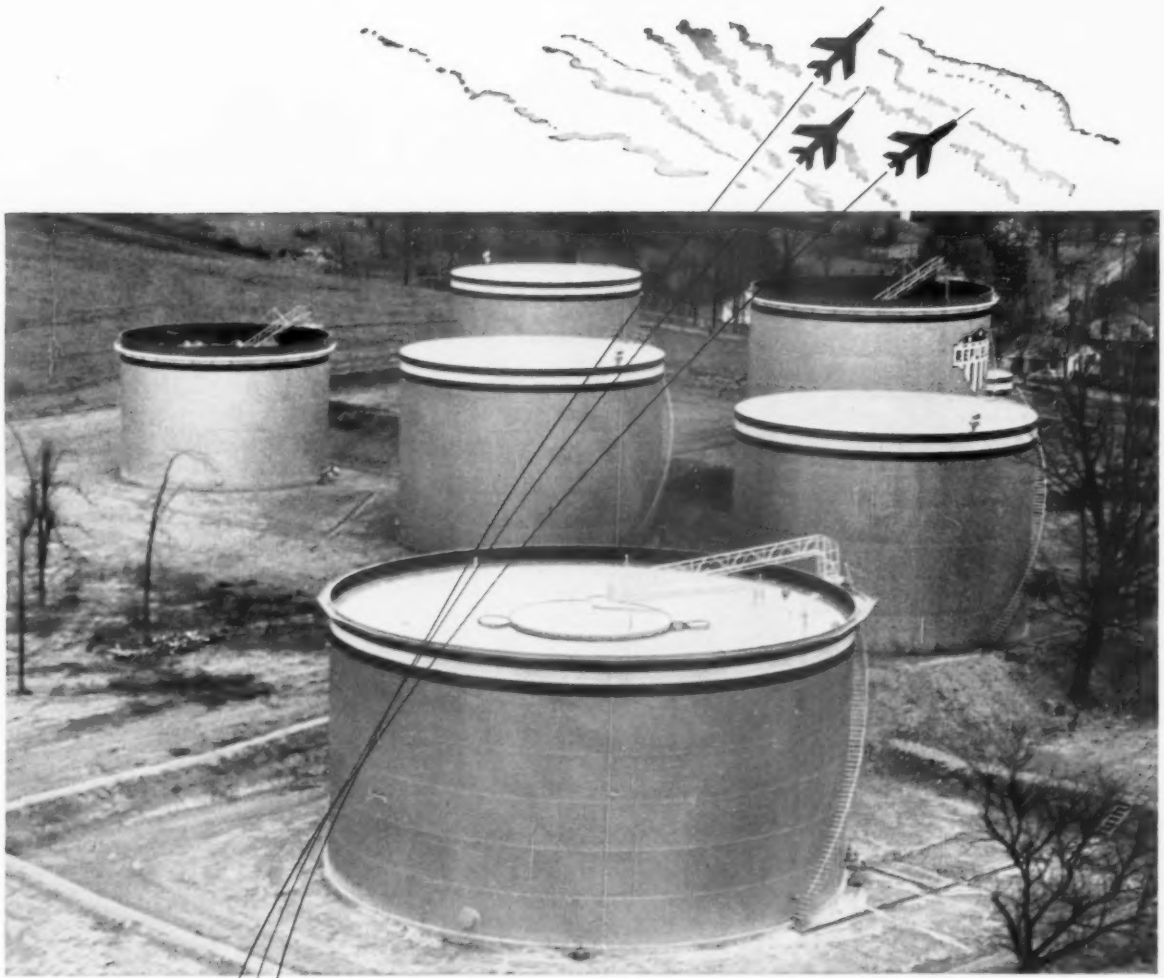
Wells producing from the Smackover "A" and "B" zones of Colquitt



186,000 BBLS. IN NEW STORAGE CAPACITY, AND—

. . . THE INSTALLATION OF FLOATING ROOFS PAID OFF IN JUST 6 MONTHS!

It happened at Knoxville, Tenn. That's where General American built a 6-tank terminal—including a 55,000 bbl. jet fuel pipeline storage tank—for Republic Oil Refining Company, a Division of Plymouth Oil Company.

"General American's unique experience in constructing and operating their own terminals helped us with our problems," says Holland Howell, Republic's chief engineer. "What's more, we found General American's 12-18 month payout estimate quite conservative. Through savings in filling and breathing losses alone, *the installation of floating roofs paid off in only 6 months!*"

As a result of this proved performance—speedy, dependable construction, definite savings and improved safety through use of Wiggins Floating Roofs—General American was authorized to build additional facilities for Republic. At Belton, South Carolina, tanks for the storage of 160,000 bbls. have been completed. At Doraville, Georgia, General American is now erecting a 110,000 bbl. sales terminal, and will erect another terminal at Macon, Georgia.

It pays to plan with General American

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STEEL PLATE FABRICATORS ASSOCIATION

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field, Claiborne Parish, La., were ordered shut in on July 8. Orders were issued by state Commissioner of Conservation John B. Hussey after a public hearing at which above-ground waste in the field was established.

Hussey stated that the 19 wells producing from the two zones will be shut down until a study is made, and another hearing is held.

•

A special subcommittee of the American Assn. of Oilwell Drilling Contractors has started a study of oil industry training in blowout prevention. The group will develop a method and program for training toolpushers, drillers, and crewmen in the cause and prevention of blowouts, and the types and operation of blowout prevention equipment.

•

Drilling Highlights

West Texas—Continental Oil Co. No. 1 T. F. Teague has opened a new oil pool in the North Wemac area of Andres County, about 3 mi. east of the county seat at Andrews. The discovery was completed for 1,345 b/d through ½-in. choke. The wildcat, drilled to 13,520 ft. in the Wolfcamp, is 2 mi. north of nearest production.

Nebraska—Lowell J. Williamson No. 1 Waitman, section 32-19n-52w, Morrill County, recovered 290 ft. of oil and 42 ft. of mud-cut oil on test of the J sand at 4,725-42 ft. The wildcat is 1½ mi. northeast of Shell oil's No. 1 Hascall discovery.

North Texas—Cheyenne Oil Corp. No. 1 L. N. Husband, section 18, C. Boger survey, Montague County, has been completed as a new Bend conglomerate discovery. The well flowed 1,344 b/d on five-hour test through ½-in. choke from perforations at 5,468-87 ft.

The new find is over a mile northwest of the West Saint Jo field area, and east and north of the Engle field area.

Wyoming—Pan American Petroleum Corp. No. 1 Willow Creek Unit, section 3-24n-114w, Lincoln County, was completed for 3.6-million cu. ft. of gas daily from the lower Fort Union, topped at 2,366 ft. The discovery is 10 mi. south of LaBarge field, and is the first well on the unit.

Oklahoma—Amerada Petroleum Corp. No. 1 Krob, section 24-25n-13w, Woods County, was completed through ¼-in. choke from perforations in the Simpson (Ordovician) sand at 7,060-90 ft. On 16-hour final test, the well flowed 257 bbl. of oil and 16 bbl. of water.

South Louisiana—Lone Star Producing Co. No. 2 Godhaux Sugars, Inc., section 33-15s-19e, Lafourche Parish, was completed for 480 b/d through 9/64-in. choke from perforations at 13,383-96 ft. and 13,404-13 ft. in Miocene sand. The well is 3 mi. northeast of the Raceland field.

New Mexico—Rex Uranium No. 1 Douthit, section 8-27n-13w, San Juan County, was completed on pump for 110 b/d through perforations at 5,418-38 ft., believed to be in the Gallup. The well is 8 mi. northeast of production from the Gallup along the Bisti trend.

Texas Panhandle—Phillips Petroleum Co. No. 1 Pshigoda, section 572, block 43, H&TC survey, Ochiltree County, a multiple-pay discovery, flowed at the rate of 798 b/d through 2-in. tubing from perforations at 5,711-13 ft. in a Douglas sand section. The wildcat also tested 6.1-million cu. ft. of gas daily in the Morrow through perforations at 8,973-90 ft.

HOW TO STOP CORROSION BEFORE IT STARTS

This scene, repeated many times in Midcontinent, Gulf Coast and West Coast oilfields, shows Nocor in the act of stopping corrosion *before it starts*. Available in liquid form, or as weighted pellets or sticks, Nocor can be made to fall readily to the bottom of the deepest wells, through high-standing fluids or against high pressures, to give chemical protection where corrosion begins.

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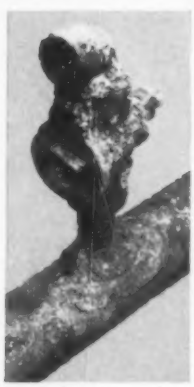
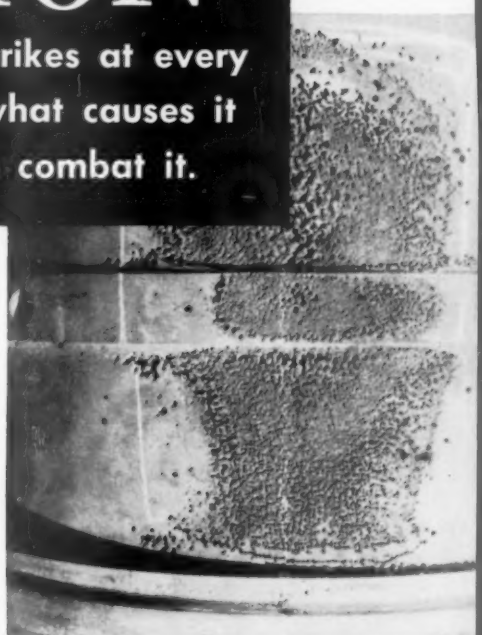
PETROLEUM WEEK / SPECIAL REPORT

CORROSION

A $2-billion-a-year headache, it strikes at every segment of the industry. Here's what causes it and what oil men are doing to combat it.





Story starts on page 32 →

Millions Are Being Spent in Oil's Se

Corrosion—nature's way of turning metal back into its native state—is costing the petroleum industry an estimated $2-billion every year in damage to equipment used in finding, producing, moving, processing, and marketing oil and gas and their byproducts.

Add to this another several hundred million dollars in related costs—such as losses of oil and products through damage to equipment, the shutdown time required to install replacement equipment, and labor charges for making necessary repairs—and it is easy to see that corrosion is an expensive nuisance, to say the least.

The over-all safety program within the industry is affected, too. For corrosion, left unchecked, can cause injury to personnel, even loss of life, through explosions, fires, and the like.

Thus it is that corrosion damage can breed increased work, lower profits, and higher prices both for the industry and for its customers.

That is why corrosion engineers say corrosion is the most costly culprit faced by the oil industry—or any industry. And finding new ways to combat it is one of the industry's most pressing problems today.

Progress in the past has come about rather slowly. But the industry can expect more rapid progress in the years ahead, thanks to management's increasing concern over corrosion's destructive forces. Just how soon or how much progress will be made in this battle is anybody's guess.

Nothing startling in the way of radical new methods or techniques appears on the immediate horizon, in the opinion of leading corrosion engineers. Rather, there will be slow, steady, well-nigh painful progress through improvements and refinements of existing techniques.

There is hope—some experts call it wishful thinking—that basic scientific knowledge will be improved as one long step toward better control. For corrosion control today is at best only an art, corrosion engineers say. As one well-known Tulsa engineer puts it: "Corrosion control has not yet evolved into the science that it should be."

Happily, the oil industry is becoming increasingly conscious of corrosion's devastating effects and high costs. And it is moving to do something about it.

Today, oil companies from coast to coast are spending millions in an unrelenting search for better methods to trim the astronomical costs of corrosion.

Many firms have more than tripled their corrosion engineering staffs over the past few years. Others have greatly increased their annual appropriations, are giving their corrosion engineers a free hand in the search for new and better control methods. These involve not only lessening corrosion damage, but also lowering corrosion-control costs.

Oil has a big stake in these efforts, for it is particularly vulnerable to corrosion attack. It is handling fluids which in themselves can be corrosive; it is operating under conditions which favor corrosion; and it uses high temperatures and high pressures, which are also conducive to corrosion.

IN EXPLORATION, delicate seismic instruments costing thousands of dollars must be protected against internal and external attack.

IN DRILLING, contractors as well as operators owning rigs must fight corrosion caused by the various fluids they use: drilling muds, acids, treating fluids, and the like. Casing and drill-pipe corrosion can eat away profits faster than the well can be drilled.

IN PRODUCTION, corrosion can play havoc with expensive pumps, sucker rods, casing, and tubing. Surface equipment is attacked by atmospheric conditions and product spillage. The producer, in fact, has more corrosion problems than any other oil man.

IN PIPELINING, the operator asks for trouble the moment he puts his steel pipe into the ground. Elaborate precautions must be taken to prevent corrosion and the resultant leaks, which may cause product loss, even fires and explosions.

IN REFINING, natural gasoline processing, and petrochemical operations, special problems arise. These stem from sour crudes, hydrogen sulfide gas, high temperatures and pressures, and high volatility of products handled. Again, fire and explosion are big hazards.

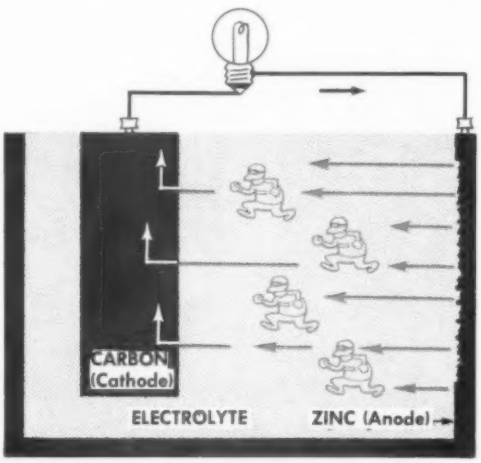
IN MARINE OPERATIONS, water and air team up to corrode tankers and barges, offshore drilling rigs, and production platforms. And the vessels, at least, are plagued by internal corrosion as well.

IN MARKETING, storage and service facilities must be protected, inside and out, against chemical and atmospheric corrosion.

What Causes Corrosion?

Experts differ sharply regarding the nature and causes of corrosion. But for want of any authenticated definition on which all can agree, it can be described simply as "deterioration of metals caused by various means."

Mountains of technical material—reports, theories, opin-



DRY CELL BATTERY utilizes galvanic corrosion to produce electricity. But in . . .

's Search for Corrosion Curbs

ions, field studies—have been published on corrosion and its control. Even so, no one fully agrees with any statement made about corrosion or corrosion control.

There is just as wide a difference of opinion as to how many types of corrosion there are. About the only thing that the engineers will agree on is that any kind of corrosion spells trouble with a capital T.

Some engineers maintain that there are three basic types of corrosion:

- **Chemical** corrosion—caused by any number of different combinations of chemical substances that damage metal.
- **Electrolytic** corrosion—caused by an electric current passing through an electrolyte (an electrical conductor such as water or soil) that is in contact with the metal.
- **Miscellaneous** corrosion—many different things that happen to metal, such as cracking, pitting, embrittlement. These all are processes which aren't fully understood and, according to the engineers, "may or may not be true corrosion." Included in this category is "atmospheric" corrosion caused by weather and the like.

Other engineers break these down somewhat differently. They say that there are at least five basic types of corrosion:

- **Sour** corrosion—caused by sulfur, sulfides, and sulfide gases.
- **Sweet** corrosion—caused by carbon dioxide and organic acids.
- **Electrochemical** corrosion—caused by measurable currents flowing from a structure (a metal).
- **Oxidation**—corrosion that occurs wherever oxygen is present (taking in a big chunk of territory!).
- **Microbiological** corrosion—sometimes classified under sour corrosion, because it is thought to be caused by bacteria that ultimately produce sulfides, which in turn attack the metal.

In addition to these so-called "basic" types of corrosion, there are corrosive actions which can be traced to "crossovers," that is, where several types of corrosion work together, with cumulative effect. These include fatigue, fretting, impingement, graphitization or cavitation, stress corrosion, pitting, hydrogen embrittlement, and countless others.

Still other authorities say that there really is only one kind of corrosion, and that it includes everything. They call it electrochemical corrosion.

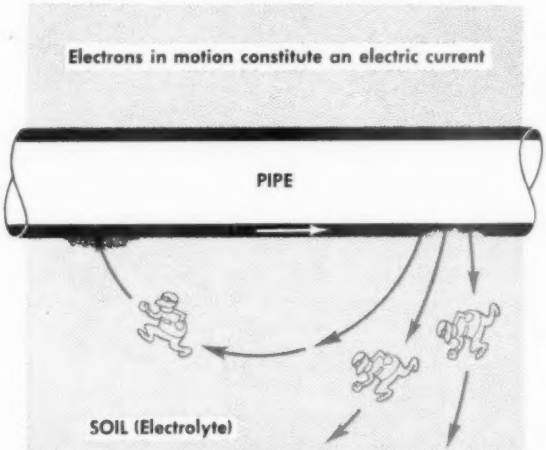
"Any kind of chemical reaction has a given electrical potential," says one well-known corrosion man. "Electrical corrosion, therefore, is actually nothing but chemical corrosion, because the current released by the metal is itself caused by the chemical reaction. After all, any chemical reaction can be called 'corrosion,' because it destroys something."

In any discussion of corrosion, experts usually follow one of these three classification systems. In this Special Report, Petroleum Week will use the system that divides corrosion into three basic types: chemical, electrolytic, and miscellaneous.

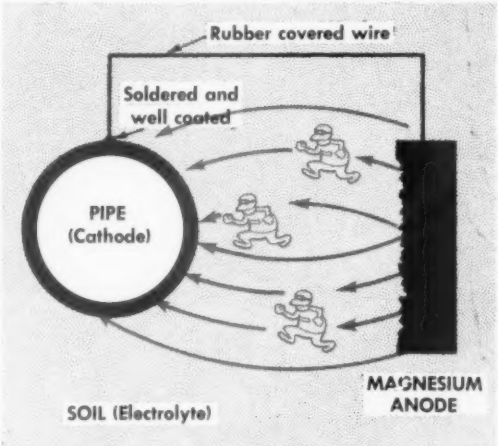
Whatever sets off the corrosive process, while important to the engineer, is not so important to management. Management is principally interested in control. It views corrosion as a universal problem, not only in the oil business, but in all business where metals are used.

How Do You Control Corrosion?

Chemical corrosion generally can be controlled by (1) changing or neutralizing the offending chemical, (2)



ELECTROLYTIC CORROSION the problem is to stop this damage to the metal (anode). So . . .



CATHODIC PROTECTION is provided to reverse the direction of electron flow.

using coatings or paints, or (3) using inhibitors, which are themselves molecular "coatings."

In changing or neutralizing the chemical that is doing the dirty work, the corrosion engineer seeks to "kill" its corrosive effect by use of other chemicals.

When this doesn't work, he will try to protect the metal by coating it in some fashion. This usually involves using some product made of rubber, plastic, resin, ceramic, glass, cement. Anything inert that will cover the "contact face" between the metal and the corroding chemical can reduce the rate of damage.

If protective coatings fail, inhibitors can be tried. Inhibitors embrace a wide range of organic and inorganic salts, and other compounds. They are introduced with a fluid or with a volatile, and find their way to the face of the metal, where they presumably are adsorbed to form a protective molecular coating. Due to their fluid nature, they can penetrate into all types of curves, turns, and crevices—places that cannot be reached with paint-type coatings.

So far, however, there has been no "universal inhibitor" placed on the market that will do a good job of protecting metals in all branches of the industry, under all conditions.

Electrolytic corrosion, caused by currents emitted from the metal itself, can be counteracted by halting this outflow of electricity.

To understand the mechanics of electrolytic corrosion, you simply have to remember how a common dry cell battery works. In the battery, the zinc case is the anode, the carbon rod in the center is the cathode, and the substance between them is the electrolyte or conducting material. When you connect a lamp to anode and cathode, electrons flow from the anode through the electrolyte to the cathode, then back through the lamp to the anode. Corrosion occurs where the current leaves the anode and enters the electrolyte.

Exactly the same thing can happen in a pipeline, or in casing in an oil well. Minute quantities of electricity leave the pipe at some point—often a scratch, tong mark, or other imperfection—flow into the soil (which acts as the electrolyte), and to a cathode—which can be an adjoining piece of metal or even a different section of the same pipe or casing. If the circuit is completed so that current can flow freely back to the anode from the cathode, there is the danger of corrosion at the point where the current leaves the pipe.

"N.G.—LEAKER." This terse comment scrawled on the bottom of a discarded tank is a good illustration of why corrosion costs the oil industry $2-billion every year.

One way to prevent this corrosion is through use of sacrificial anodes (galvanic cathodic protection). These anodes usually are magnesium rods, though zinc or aluminum are also used. They are placed in the ground near the steel to be protected. An insulated wire is connected to the two to complete the circuit. In this arrangement, current flows from the magnesium to the steel and back through the insulated wire. The magnesium rod, rather than the pipe, is corroded. But the rod is easily replaceable.

Another way is to use anodes which are energized by an external source of direct current (electrolytic cathodic protection).

But this system has some drawbacks. If electricity is purchased, it probably will be alternating current; and the equipment required to convert it to direct current can be expensive. Sometimes power is not available in remote areas such as those through which pipelines run. If the pipeliner needs an unusually "hot" charge to protect his pipe, he may install a generator; otherwise he may find galvanic protection more economical.

Miscellaneous corrosion, and "crossover" types of combination electrolytic-chemical-general corrosion, are controlled in various ways, depending upon the individual situation. No standardized protection methods are possible.

In some of the "special" types of corrosion problems (which may or not be true corrosion), redesign of equipment often is necessary to eliminate or control the damage. For example, more metal can be placed at critical points. Corrosion still will occur, but, with a thicker wall of metal, the equipment can be used for a longer time before being shut down for repair of corrosion damage.

Substitution of metals often eliminates certain peculiar corrosion problems. However, this may be expensive, since it involves the use of costly nickel, Monel, and other high-alloy steels. Even the control of surge rates in vessels will curb certain types of corrosion caused by caustic and volatile fluids.

In combatting these special problems, neutralizers, passivators, inhibitors, coatings, plastics, cathodic protection—all control methods known—have been used. They may be employed separately, or in combination, to solve the particular problem at hand.

In atmospheric corrosion, protective paints and coatings are the standard procedure.

What Lies Ahead?

Right now, it looks as if the biggest field for corrosion control lies in the inhibitor and coating fields.

And because inhibitors are easier to apply to interior surfaces of metals, they probably will get the major play in the years ahead.

Coatings suffered after World War II because many of them failed to live up to the claims made for them, says another expert. "However, with improved plastics, resins, and better use of fibrous glass and ceramics, plus the new chemical compounds now going into protective coatings and paints, I believe this field of corrosion control will grow."

Electrical control systems (cathodic protection) will remain an important method for combatting corrosion caused by electrical currents.

Pipeliners have been the major users of cathodic protection, and offshore operators have turned to it in their efforts to protect their structures.

About the only really new development is the increasing use of these cathodic protection systems to protect casing in field wells.

Control contractors, who take over corrosion problems and solve them for a fee, will probably increase in number. The oil industry is getting more contract conscious, and it is only natural that it turn to specialists in a field that calls for as highly specialized knowledge as does corrosion.

These contractors already have made important strides in developing their services (PW—Jul.20'56,p14).

Research will continue on all fronts; record sums will be spent in an effort to find more effective ways to combat corrosion.

One director of corrosion-control research in a large Mid-Continent company sums up the research situation this way:

"Corrosion costs money, but protection is relatively cheap. As long as this holds true, we'll be looking for better ways to get that protection."

He says his firm is devoting its entire research program to getting "a better understanding of the mechanisms, or chemistry, of corrosion, plus improved methods of detecting the severity of corrosion."

The National Assn. of Corrosion Engineers has done much to crystallize and organize corrosion thinking, engineers agree. And the benefits of its efforts are bound to be felt in the years ahead. One benefit: It provides an ideal medium for exchange and discussion of ideas and problems.

In Exploration:

Seismic Tools Need Special Care

SPRAYCOATING protects components of geophysical equipment in Seismograph Service Co.'s "Tropicalizing" chamber.

Atmospheric corrosion is the major trouble-maker for the delicate seismic instruments used in exploration work.

These instruments, costing many thousands of dollars, must be taken into the field under highly adverse conditions, in many instances. They may be subjected to the ravages of mud, swamps, mountains, deserts, salt water.

So they must be properly designed to stop corrosion before it can start, hermetically sealed, and coated with protective sealers.

The experience of one larger manufacturer of geophysical equipment is illustrative of what often must be done. The seismic recorders it makes had proven highly dependable—on land. But trouble developed when the equipment first was used offshore. After the shot was fired, many of the traces would not show up clearly on the photographic paper. This left a "hole" in the data needed by the geophysicists.

"We soon found the trouble," the maker said. "Moisture had penetrated into our circuits. It combined with salt in the air to form a thin film between the metal contact point. This deposition prevented the electrical impulses from getting through and making the necessary contact at the vital moment the shot was detonated.

"We solved the problem by bringing our equipment back into the shop and hermetically sealing the electrical circuits, including all the microswitches we use. We no longer have this trouble."

In this instance, a corrosion engineer would perhaps

raise the question: "Was this actually corrosion?" Be that as it may, a reaction occurred that laid down the deposit on the contact points. So the manufacturer wrote the problem down as one caused by "corrosion."

Most geophysical equipment manufacturers give their instruments special protective treatment.

An example here is the practice followed by Seismograph Service Co., Tulsa. It "tropicalizes" all its geophysical equipment to withstand the varied climatic conditions encountered throughout the world.

At SSC, a special "tropicalizing chamber" is in operation. All electrical components are subjected to intense humidity and high temperatures, over long periods of time. Hermetic sealing and special protective coating sprays are used to keep moisture out of the instruments.

But cathodic protection and inhibitors are not commonly used—mainly because the equipment is constantly "on the go."

Equipment used in gathering geophysical data normally is not stationary to the point that any electrolytic action from stray currents, or galvanic corrosion set up within the metals of the instruments themselves, would damage them.

And, since the sensitive components are sealed in, or are heavily encased in steel containers which are coated with plastic or other special corrosion-resisting material, there is no need for using inhibitors.

In the more remote northern areas, some corrosion of drill pipe and bits used in shot-holes occasionally occurs. This usually results from the fact that shot-hole crews have to use salt with water to prevent the water from freezing while holes are being drilled for explosive charges. But this difficulty is not encountered very often, and no extreme chemical attack is experienced. So use of inhibitors is regarded as unnecessary.

Cathodic protection in at least one form is sometimes used on shot-hole equipment, however. It is painted with a special zinc-dust pigment that prevents rapid rust. The zinc cathodically protects the steel by sacrificing itself to the elements—the same principle used in galvanizing, zinc plating, and zinc spray.

One such special primer is Copon Zincguard, manufactured by Coast Paint & Lacquer Co., Houston. In one test, three coats of Activated Copon provided more than a year's protection to geophysical equipment owned by Marine Exploration Co., Houston. The corrosion that did occur was attributed by engineers to "spillages and abrasion."

Other specialized coatings also are used, from time to time, in the exploration business. These include the epoxy resins made by Shell Chemical Co. under the name Epon. These special ester resins have received wide application in coating marine equipment used in offshore seismic operations.

In Drilling:

Rigs Require Protective Coatings

Protective coatings are the main fighting tools of the drilling contractor and rig owner, because rigs are subjected primarily to atmospheric attack.

Such items as shale shakers, derricks, rotary equipment, fuel tanks, lead lines—all components going to make up a completely-assembled rig—must be painted properly to prevent rust and other atmospheric corrosive attack.

The Shell epoxy ester-type coatings (Epon) are used on mud pumps, for example, to protect them from the atmosphere and from spillages of mud. This tough, durable plastic resin forms a coating that will last for months under adverse conditions.

Blowout preventers and other well-control apparatus often are subjected to corrosive action of drilling mud having a high alkali content. This mud can cause ordinary paints to peel off in a day's time. Again, coatings of the Epon type can be used to nullify these effects upon metals.

Synthetic and natural-latex rubber coatings are in wide use around the rig, too, to protect structures. Tests have proved that butadiene-styrene coatings will stand up for months under rugged use.

Rig owners have come to rely on many different coatings. Among them: resin-and-oil varnish, either hot or cold, such as the phenolic group, glycerol, or pentaerythritol (made from natural gas and hydrogen); alkyd resins made of glycerine or pentaerythritol-phthalic anhydride esters; and vinyl resin coatings, made of vinyl copolymers.

Chlorinated rubber is excellent for weather resistance, dries quickly, lasts for months under most conditions, and can be patched with ease.

Corrosion to down-hole equipment is attracting increasing concern, especially in areas where extremely corrosive conditions may exist.

Complicating this problem is the fact that corrosion is very unpredictable. As one engineer puts it: "One well may be drilled without any difficulty, while another one, a mile away, drilled under the same conditions, may give the operator all kinds of corrosion problems."

For the most part, drilling contractors are not too concerned with down-hole corrosion. They leave corrosion control to the producer. Says a Tulsa engineer who works for a large production company:

"If you went out and visited a hundred drilling rigs, scattered all over the country, I doubt if you'd find more than one or two where inhibitors are being used as a preventive measure during drilling."

He concedes, however, that "quite a lot" of experimentation is being done in the use of chromates—inorganic inhibitors usually used in refining and in water

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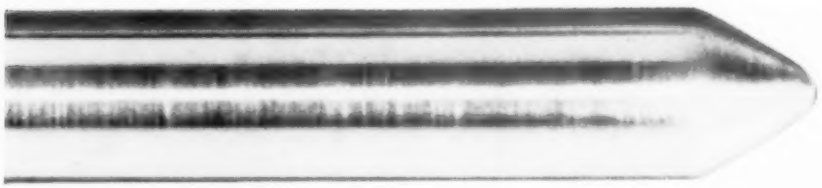
VIRCO-PET 20

VIRCO-PET 20

Note the absence of corrosion from this steel specimen protected with 0.1% Virco-Pet 20 and exposed for 24 hours in a mineral oil-sea water system at 140° F.



ORDINARY INHIBITOR

Note the corrosion on this steel specimen, protected with a 0.1% commercial inhibitor and exposed for 24 hours in a mineral oil-sea water system at 140° F.

THE V-C LINE

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Sodium Metasilicate
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Dimethyl hydrogen phosphite
Diethyl hydrogen phosphite
Dibutyl hydrogen phosphite
Bis(2-ethylhexyl) hydrogen phosphite
Trimethyl Phosphite†
Triethyl phosphite†
Triisopropyl phosphite†
Tributyl phosphite†
Trihexyl phosphite†
Triisooctyl phosphite†‡
Tris(2-ethylhexyl) phosphite†
Tris(2-chloroethyl) phosphite
2-Ethylhexyl octylphenyl phosphite
Diethyl ethylphosphonate
Dibutyl butylphosphonate
Bis(2-ethylhexyl) 2-ethylhexylphosphonate
0,0,0-Triethyl phosphorothioate
0,0,0-Tributyl phosphorothioate
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Virco-Pet 20 is a tan-colored, viscous liquid, specific gravity $\frac{20}{4}$—0.96—1.00; viscosity (stokes) 10.5—11.5. Readily emulsifiable in water, Virco-Pet 20 is soluble in acetone, ethanol, ethyl acetate, carbon tetrachloride, benzene, kerosene, gasolene, mineral oil, and ethylene glycol.

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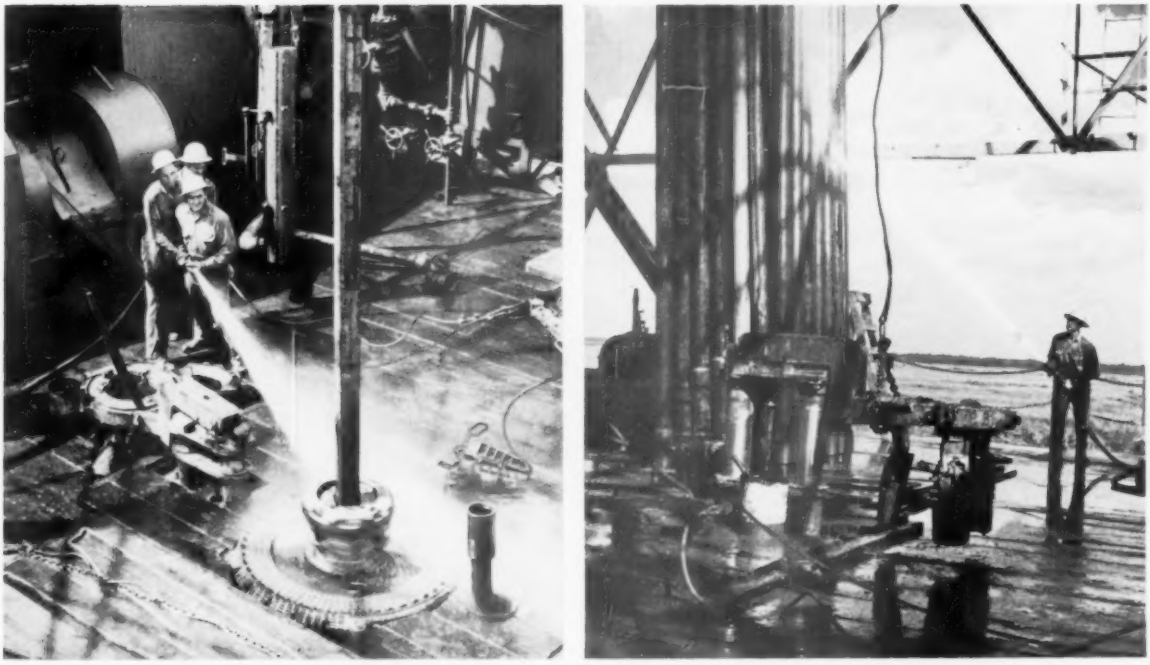

CLEANING DRILLPIPE with water and inhibitors as it's pulled (left) and after it's stacked (right) helps control corrosion.

treatment—to cut down on drill pipe, bit, and casing corrosion.

In one case, a drilling contractor in West Texas now is using 17 different types of inhibitors in the same field in his efforts to cut down tubing corrosion and internal damage to casing and sucker rods.

Sour gas, drilling fluids, and formation fluids all are corrosion hazards that can confront the contractor—particularly when they are combined with high temperatures and high pressures.

In one instance in Southwest Texas not long ago, an operator working with aerated drilling mud in an effort to increase bit penetration found that corrosion was causing all kinds of trouble down-hole.

By mixing compressed air with the drilling mud and water solution, thus aerating the fluid, he unwittingly set up the perfect opportunity for corrosion to occur. The oxygen, hydrogen, and caustic effects of the drilling mud caused corrosion that ate through the drill pipe and casing in an alarmingly short time.

"Our drill pipe looked like a piece of lace," said one of the company's engineers.

In this case, the corrosion undoubtedly occurred because all of the contributing factors were "just right." Wells drilled in other areas with the aerated mud technique might not encounter this trouble at all.

Corrosion problems in sour crude areas magnify as wells get deeper. The higher temperatures and pressures, in the presence of sulfides, can speed up the corrosion process markedly.

Drastic differences in formation characteristics can cause electrolytic corrosion of casing even while a deep well is being drilled.

Steel is not homogeneous, but has flaws that may be invisible to the naked eye. Should one of these flaws in the casing happen to wind up opposite a zone having vastly different characteristics from other formations, electrolytic corrosion may occur.

The current which the pipe sends out into the formation, combined with the differences in chemical makeup of the formations, can knock holes in casing in an amazingly short time.

In certain instances, rig operators may be faced with severe electrolytic corrosion from stray electrical currents, coming from some outside electrical source. This could be a d.c. motor or generator used around the rig. But this type of corrosion usually acts at a slower rate than chemical corrosion under severe conditions, and is more of a problem to the producer than to the contractor.

Cathodic protection is sometimes used under these circumstances; but this method is far more widely used in offshore areas than on land.

Wet, dirty drill pipe stacked on the rig floor is a likely victim of corrosion. Damage occurs more often there than down the hole. To combat this, inhibitors are introduced with the drilling fluid, or, more often, they are placed in the water that the crew uses to wash over pipe to remove mud solids.

Every contractor knows that corrosion can best be minimized by proper handling of equipment. The fewer scars, excessive tong marks, scratches, and damage by rough handling of drill pipe, casing, and other equipment, the less damage there is apt to be from corrosion.

In electrolytic and chemical attack on metals, the slightest imperfection, scratch, scar, or pit caused by careless handling can sometimes set up an "exit" for electrical current—and it's at these exit points (or anodes) that corrosion occurs.

MAGNESIUM ANODES, installed near a wellhead, give cathodic protection to the casing of producing wells.

In Production:

Corrosion Hits Operators Hard

The producer of oil and gas is plagued by more corrosion problems than any other man in the oil business. As a consequence, the oilfields have become the big "proving ground" for many of today's accepted corrosion-control aids.

Operators have to contend with chemical corrosion, because the products they handle—oil, gas, condensate, and water—all have a tendency to set up chemical actions that destroy metal. Acids and other treating fluids add to the problem. Operators are also faced with electrolytic corrosion. Electrical currents from the metal itself go into the ground and the metal is destroyed. And the so-called "miscellaneous" forms of corrosion—atmospheric attack and others—have to be fought.

When a producer is lucky enough to solve—or at least to control—his corrosion problems over the life of his primary production, he faces a whole new bout with corrosion as he moves into secondary-recovery work.

Injection of water during the water-flooding process can set off bacteriological corrosion that never formerly existed. And a producer can find that, due to these bugs, his sweet production turns sour—so he is faced with all of the headaches that go along with handling sulfides in production.

According to reliable estimates, the four largest oil producers in the U. S. are losing some $20-million in damage to producing equipment every year, exclusive of casing, due to various corrosive processes.

This cost does not include casing replacement, lost products, shutdown time, or labor costs in removing the old equipment and reinstalling the replacements. (Casing costs due to corrosion damage are a huge sum in their own right).

"Corrosion costs money, and that figure should prove it," an engineer for one of the four companies says.

"We estimate that our own corrosion costs on sour-crude wells run about $104 per month per well, in equipment replacements alone. But we think that if an operator will use corrosion-control methods, such as inhibitors, he can cut that cost to about $60 per well per month. The cost can be trimmed from $107 to $84 per well per month on an industry-wide average, we believe.

"But it's impossible to end all corrosion costs, because the control materials used have to be figured as corrosion costs."

One company says that, due to its research efforts, it is saving some $700,000 a year in one sour-crude operating area in West Texas, by use of inhibitors.

"We noted these savings in 1956 over 1955, and they are considered to be the results of our 1955 research program," says the company.

This $700,000 was trimmed from a total corrosion cost for that year of $5-million. But this is an extreme case, in that about 90% of the firm's wells have severe sour-crude corrosion problems.

The company is using several different kinds of inhib-

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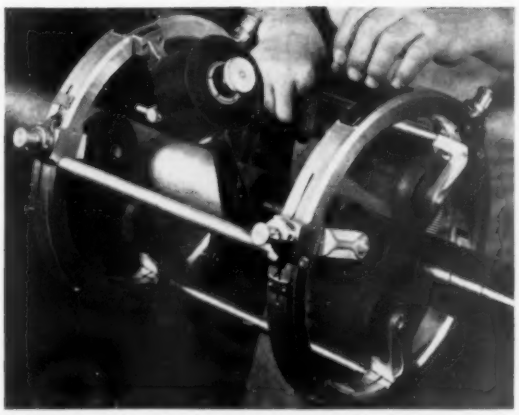

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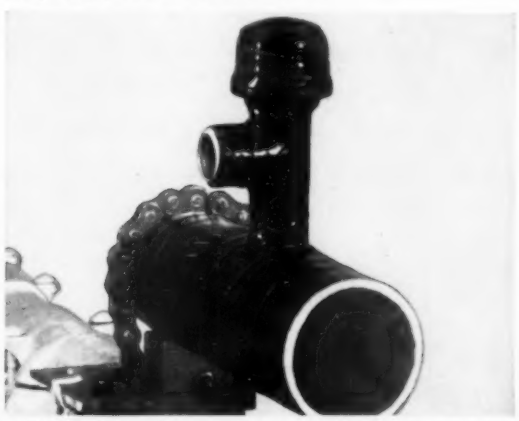

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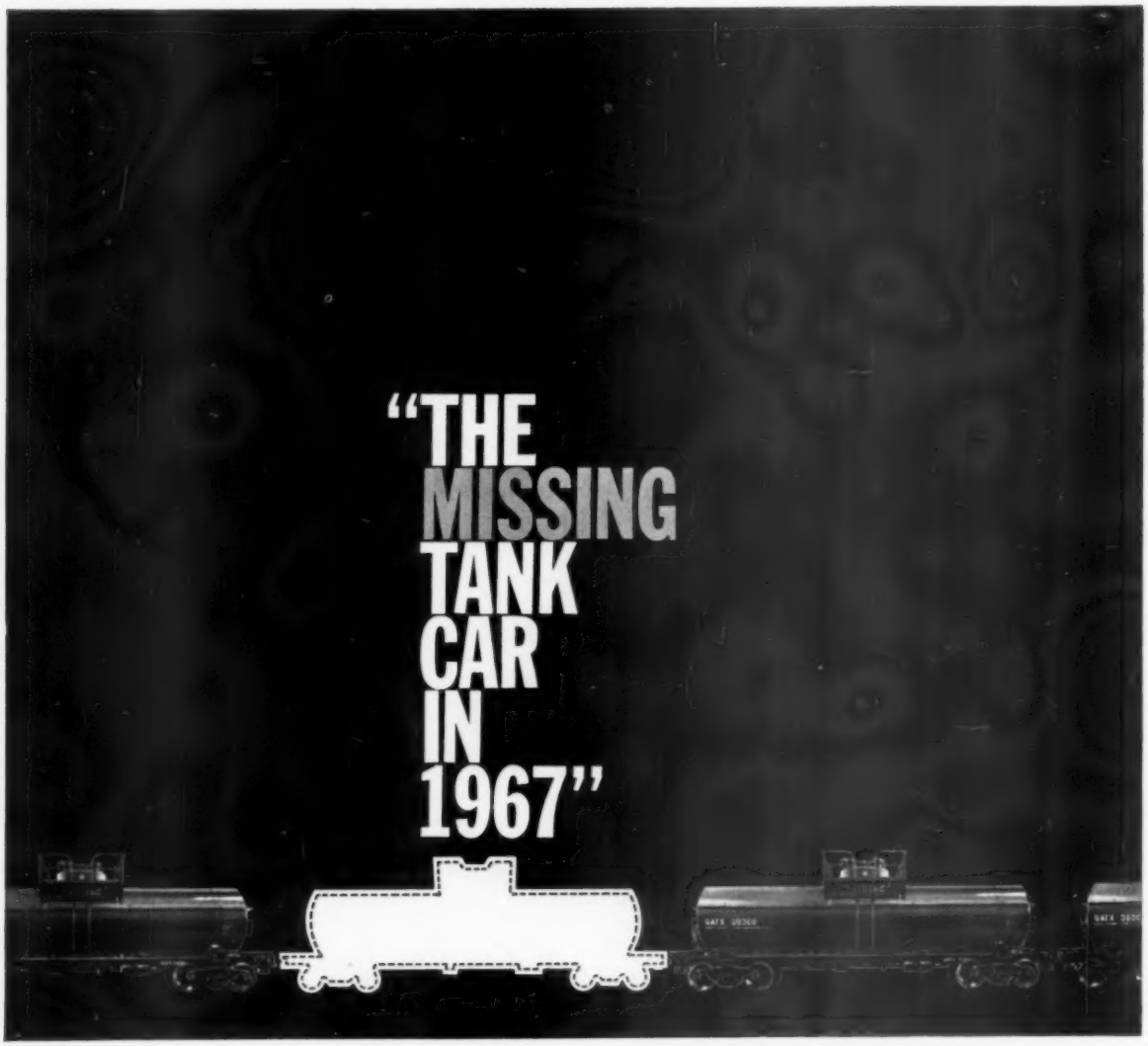

"Somebody was guilty. Here we are—production coming out of our ears—sales opportunities popping in every direction—new profits practically under our noses—and somebody had failed to order enough general-purpose tank cars to make deliveries.

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itors—all organic—in an effort to cut down on the chemical corrosion to metal set up by the sulfides. The inhibitors are primarily amine salts and aliphatic amines (amine salts of fatty acids), which form a protective film on the tubing and inside of the casing walls.

Another operator in the Mid-Continent area has been able to cut his corrosion costs in one field some $250,000 a year by using inhibitors.

An operator in the Midwest reports that, in a large field in Kansas, wells were produced for more than 20 years without any appreciable sign of corrosion. But following start of a waterflood, corrosion has become a serious problem in a short time.

"We never had any trouble in this field until we started waterflooding," says a company engineer. "Frankly, we haven't figured out yet what the cause is.

"Is water contaminating our formations, causing bacteriological corrosion? Who knows? All we can do is theorize as to what is taking place, and try to inhibit the wells to control the damage."

Corrosion's unpredictability is a real headache for the producer. Everybody has run up against this problem at one time or another.

"You may have some wells that will pump for 20 years without a single rod break or other corrosion problem," says an engineer, "while another group of wells ½ mi. away, producing the same zone under the same conditions, will give all kinds of corrosion trouble."

Acidization of wells to increase production can often set up corrosive action on tubing and casing. So great care must be used, and inhibitors added to the acid.

One large service company says it is concerned with corrosion chiefly because it does not want to damage its customers' wells during acidizing. Therefore, it has done and is doing considerable research in the use of inhibited acids. This company has constructed an autoclave in which acids used in treating wells are subjected to high pressures and temperatures, to simulate bottom-hole conditions in deep wells.

Of all the various types of inhibitors tested, there is one that is "marvelous," says a service company—but it cannot be used with safety. It is arsenic.

"Petroleum processors don't want arsenic inhibitors used in any well, because they will affect the processing when the crude gets to the refinery," says a company engineer. "Even a billionth-part is enough to poison the refiner's catalyst."

Acidizing can cause some extreme corrosion problems in old producing wells when they are re-treated.

An example is one West Texas well a service firm was called in to reacidize.

"This well had its tubing literally eaten up on bottom by previous acidization jobs," says an engineer.

"We figured that, in four previous acid jobs, the acid had been in contact with the metal for approximately 19½ hours. Temperature was above 200F.

"This time of contact permitted the hydrochloric acid to eat four joints of tubing on bottom, where pressure and temperature were greatest," he said.

In acidizing any well, the acid slug should be injected into the formation and removed as quickly as possible, to prevent corrosion to tubing and casing, says one service company.

"The best inhibitors available should be used during acidization of wells where pressures run 6,000 to 7,000 psi.," says the engineer.

TESTING INHIBITOR performance, Tretolite Co. corrosion engineer takes sample of well fluids.

In acidization, this service company uses 15° Baume hydrochloric acid. "We dilute it before we use it, but it is shipped to us in rubber-lined trucks," the engineer says.

"We are currently experimenting with laminated-plastic transport tank trucks to haul the acid. If they work out, we can cut our handling costs quite a bit. We can't use rubber linings around oil, of course, because oil rots rubber."

In selecting an inhibitor for use in a producing well, three basic questions must be considered, says one expert.

- **Will it protect?** Laboratory tests will show whether the inhibitor has the necessary basic protective properties.
- **Will it give a "wetting" effect to the metal?** Without this characteristic, the inhibitor never would get down under the film of oil and onto the face of the metal.
- **Does it have adsorption properties?** Unless it will adhere to the metal face, its protection at best will be only temporary.

Distributors of various inhibitors claim their products will give lasting protection in producing wells, under just about any condition encountered. Consequently, there is a big market in this field.

Visco Products, Houston, offering a wide range of inhibitors, is presently testing several new types of compounds, the company told PETROLEUM WEEK. A "more fundamental approach" to field corrosion problems is now possible, according to the company, because of the information and experience gained in the field.

According to Tretolite Co., of St. Louis, which makes

several types of inhibitors under the name of Kontol, materials now available will do a good job of protecting metals used in oil and gas wells. It's simply a matter of introducing the inhibitor down the well.

Getting the inhibitor down the hole is simple in the case of pumping and injection wells, but difficult in the case of flowing wells.

In pumping oil wells, the inhibitor is simply introduced down the annulus between casing and tubing. It goes to the bottom of the hole, comes up through the tubing with the oil.

The same applies to injection wells used in waterflooding. The inhibitor is introduced with the water.

With flowing wells, however, the problem is to get the inhibitor to the bottom of the well through the fluid and pressure. One common method is to use an inhibitor "stick"—with enough density to go down the hole. But this sometimes causes a long shut-in period.

A somewhat complicated method, using a bottom-hole injection valve between the casing and tubing, is now being tried.

Sun Oil Co. is reported to have developed a "dump bailer," a tool that is filled with inhibitor and lowered into the hole on a wire line. When the line is raised, a trigger in the bailer releases the inhibitor into the well.

Gas wells present some problems in introducing the inhibitors, according to engineers. On lower-pressure wells, an inhibitor solution can be pumped into the annulus between casing and tubing, and the bottom-hole injection-valve method utilized. Stick inhibitor also can be dropped down the tubing. Or the inhibitor can be pumped in, although this requires use of a lot of carrying material, causing a long shut-in period. The dump-bailer method is also being used on some gas wells.

Use of inhibitive "pellets" might be the answer for high-pressure gas wells, but there are a lot of difficulties in using them. A number of companies now are working on this problem.

Gas-lift pumping wells pose still another mechanical problem: The inhibitor causes the valves to open prematurely, and the material "blows out" of the operating valve.

Use of inhibitors in condensate wells is "a good, sound economical device," according to a large producer on the Gulf Coast.

The waterflood operator faces many corrosion problems: He has internal corrosion, caused by hydrogen sulfide, oxygen, and carbon dioxide, and external corrosion, caused by electrolysis.

According to Ray W. Amstutz, of Earlougher Engineering Co., Tulsa, there are six methods of "detection or prediction" of internal corrosion in waterflooding operations: (1) water analyses; (2) corrosion coupon tests; (3) corrosion probe tests; (4) bacteria tests; (5) review of the history of corrosion of the field; and (6) examination of existing equipment.

"Complete water analyses are the first requirement," says Amstutz. "They offer some indication of possible corrosive agents, and their concentrations may be used as a rough indication of the severity of the expected corrosion."

Coupon tests are excellent for relative comparisons, he says. Indicated corrosion rates obtained by such tests usually cannot be applied directly as a measure of the rate of corrosion of the equipment, but they can be used to evaluate results of mechanical or chemical changes in the injection system.

Corrosion probe-test results are similar to coupon-test results. Principal advantages of probe installations over coupon installations, he says, are that the probe data can be obtained without interrupting operations, and the results can be obtained more quickly.

The required interval of time is much shorter for probes than coupons, too. Daily readings of a corrosion probe should reflect the change in corrosion rate, while a two-week exposure of coupons may be necessary to show the changes.

"Bacteria tests are important for corrosion evaluation," says Amstutz, "principally because of the frequent contamination of flood waters with hydrogen-sulfide-producing bacteria. The most common, of course, is the sulfate reducer, and inhibition of this type of bacteria is justified from a corrosion viewpoint."

Aeration should be used to remove the hydrogen sulfide if an inhibitor will not provide satisfactory corrosion control, says Amstutz. During aeration, much of the hydrogen sulfide is driven off as free hydrogen sulfide gas.

Organic bactericides seem to have even less universal application for the treatment of bacteria control than do the corrosion inhibitors, he says. Chlorine is one of the cheapest and most effective bactericides; however, he says, it has limited application because it tends to oxidize ferrous iron to the insoluble ferric iron, and has no corrosion-inhibition qualities.

External corrosion plagues the waterflood operation because corrosion attack on existing water-injection or oil-gathering lines is present. Pipe-to-soil potentials, surface potentials, and soil resistivities are the most useful determinations for detecting or predicting this type of corrosion. Cathodic protection with magnesium anodes will usually handle the situation.

Use of magnesium anodes to retard casing corrosion is increasing. This galvanic cathodic protection of well casing is about the only new thing in electrical protective systems for the oilfields, say corrosion engineers.

Since corrosion by electrical currents can be caused by (1) a charge running down the casing from connected flow lines, (2) stray electrical currents from d.c.-motor installations, (3) galvanic action due to differences in metals or formations, or (4) bacterial action, the best way to control the damage is by use of cathodic protection.

Electrolytic cathodic protection can also be used, but this is more expensive.

In using magnesium anodes, according to Hugh A. Brady and Yale W. Titterington, corrosion engineers with Corrosion Services, Inc., Tulsa, the anodes are placed in "beds" and connected to the well casing. The anodes are surrounded by a special low-resistivity backfill, which enables the electrical currents to flow freely to the casing.

Coatings and plastics are being successfully used by producers in the fight against corrosion by chemical attack and atmospheric conditions.

Producers are finding that there is a coating commercially available to fit just about any type of need. These coatings range from synthetic rubber and plastic-impregnated glass to resins and ceramics.

Special paints that adhere to metal and prevent damage by vapors from storage tanks and other storage facilities

are in wide use. Most of the big industrial paint firms have separate lines of corrosion-resistant coatings, made especially for the handlers of petroleum and petroleum products.

The use of plastics, alone, is gaining, in spite of their generally higher costs over steel. The savings in handling and replacement costs over short periods are often enough to make the higher initial cost justified.

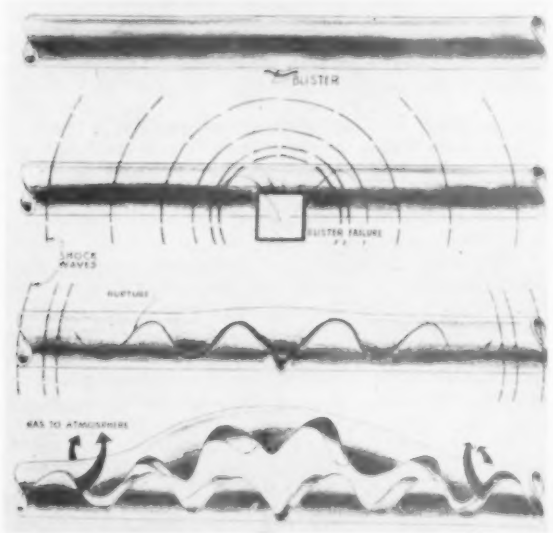
Plastic tubing and flow lines for use in sour-crude areas have been on the market for several years; at least two companies are experimenting with the manufacture of plastic tanks impregnated with fibrous glass, to hold sour crudes and other caustics.

The biggest use of plastics in the oil industry to date seems to have been in the sour-crude producing areas of Kansas, Texas, and Arkansas. Complete all-plastic tank batteries are now in operation in these areas, handling highly corrosive fluids successfully.

Various spray coatings are also used for valves and fittings in the oilfields.

In Pipelining:

Electrolysis Is Major Obstacle



HYDROGEN "BLISTERS" can wreck a pipeline (above), as El Paso Natural Gas Co. engineers learned. Shock waves caused the heavy pipe to "unravel" (sketch, below).

External corrosion by electrolysis, plus internal corrosion by various chemical actions of the fluid it carries, pose real threats to every pipeline.

Steel pipe is expensive, particularly the large-diameter pipe now being used across the country for long crude, product, and natural gas transmission systems. So it stands to reason that pipeliners take every known precaution to protect their investment.

No two lines are the same. So the corrosion problems are never the same. One control method may give good protection on a certain line, while the same method on a similar line laid under similar circumstances in the same kind of earth will not give effective protection. This is why it is so hard to pin down average cost for a corrosion-protection system for a pipeline.

External coating and wrapping of a pipeline is a vital part of corrosion control. It is a specialized art, and must be done with care.

All of the big pipeline contractors scattered over the U.S. and Canada use special equipment, designed to apply coating and wrapping materials properly to the pipelines.

The coating and wrapping operations are done by a continuous process just before the pipe is lowered into its trench.

After the pipe is coated and wrapped, "holiday detectors" are run over the coating to make certain it contains no holes, scars, scratches, or tears. For, once the line is buried in the ground, any "holidays" would become starting points for electrolytic corrosion.

Many types of coatings are used: coal tars, plastics, resins, corrosion-resistant paints, cement, rubberized asphalt.

A wide variety of special wrapping materials are also used, including fibrous glass wrapping, which is inert and is not affected in any way by electrolysis, once it is in the ground.

In marine-pipeline operations, the pipe is often encased in cementitious materials several inches thick, to prevent both electrolytic corrosion and damage from boring sea organisms. The heavy coating also serves as a weighting material, to help keep the line on bottom.

Cathodic protection is a must for defeating external

corrosion caused by electrolytic action, once the pipe is laid.

Both electrolytic and galvanic cathodic protection are used (page 34). In fact, pipeliners are among the largest users of these systems, particularly the galvanic system, in which magnesium rods are installed near the pipeline.

Where an extra "hot" charge of electricity is needed to counteract this type of corrosion, electrolytic cathodic protection may be used. In remote areas, this might necessitate installing generator units to provide needed power—a deterring factor cost-wise.

Internal corrosion of pipelines can usually be controlled by use of inhibitors, and by internal coating of the lines, in place, with corrosion-resistant paints, resins, and plastics.

Fluid carried in a pipe has an effect on its inner walls. For example, in handling sour crudes, the hydrogen sulfide, combined with moisture in the line, can attack the metal, causing pitting, blistering, embrittlement, and structural failure.

Inhibitors, usually organic and similar to those used in protecting well casing and tubing, can be introduced with the fluid being moved through the line, to give the pipe protection. These inhibitors can go anywhere a fluid or volatile can move, and they form a molecular coating on the face of the metal.

It is thought that the inhibitors adsorb onto the metal to give protection at the critical "interface" between the metal surface and the fluid handled. These organic inhibitors are chiefly composed of amines or amine salts.

Internal coating of pipelines in place is hailed as a major development by pipeliners. One big advantage of coating the insides of lines—usually with plastics or enamel—is that the coating not only cuts down on damage to the metal, but actually decreases flow resistance, because of its extra-smooth surface.

Internal coatings also help reduce deposition within a line. Scale, rust, and chemical formations caused by reactions within the pipe—"slag" and other "gook"—can actually clog up the line in short order, necessitating shutdowns for repairs.

The deposition begins to attach itself to the rough sides of the wall of the pipe. And once it gets a start, it builds up quickly. The slick coating of plastic or enamel, however, will usually prevent the materials from getting that critical first foothold on the pipe wall.

Pipelife Corp., Tulsa, has developed special equipment and techniques to coat the internal surface of pipe while it is in place. The company uses Epon resin materials with high chemical resistance.

Natural gas transmission lines sometimes are afflicted by hydrogen "blisters." These have been licked by use of organic inhibitors.

Typical of this type of corrosion is the experience of El Paso Natural Gas Co. several years ago. It was described by Felipe Paredes and W. W. Mize, senior engineers at El Paso, at a meeting of the American Society of Mechanical Engineers.

The company constructed a 24-in. trunk line, with 16-in. and 8-in. laterals, from Barker Dome field to a natural gas treating plant in Fruitland, N. M., in 1950. The gas contained 15% (mole) hydrogen sulfide. The new line operated for several months without trouble. Then, suddenly, a series of major breaks began. Within three months there were ten breaks.

It was soon determined that metal separations in the pipe wall were the cause of the line failures, and that the separations occurred at points where hydrogen attacked the steel.

To find the source of the hydrogen, gas from each well in the Barker Dome field was analyzed for hydrogen and other contaminants. Only one well showed a high content of hydrogen—and it was only 2% mole. From this and other analyses it was decided that corrosion on the internal walls of the pipe was the source of hydrogen.

An organic inhibitor, which had been used successfully in combatting corrosion and tubing failures in the wells at Barker Dome, was injected into the line. One quart of inhibitor per 4-million cu. ft. of gas was used.

"The corrosion was evidently inhibited," said Paredes and Mize. There were other breaks on the system after injecting the inhibitor, but these were caused by the damage already in the pipe wall.

Most of the breaks originated in the failure of a blister, and most blisters broke toward the inside of the pipe against the gas pressure. In all breaks, the pipe ripped in two places, 180 degrees apart (usually at "3 o'clock" and "9 o'clock"). The breaks continued in this position and "unraveled" at the end, following a sinusoidal curve (picture, page 47). The pattern of the rips was not disturbed by the presence of welds.

Many instances of hydrogen attack on low-carbon steel are known, but most of these have occurred in refinery vessels carrying exceedingly corrosive solutions at high temperature. Apparently, El Paso's was the first experience of hydrogen blistering in gas transmission lines.

"Corrosion is a source of atomic hydrogen," the engineers reported. "Hydrogen sulfide and carbon dioxide gases dissolve in water to form dilute acid solutions, which attack iron. [This chemical action produces hydrogen.] In the presence of a catalyst, atomic hydrogen will not combine to form molecular hydrogen, and it is this atomic hydrogen that is readily absorbed by the steel. The catalyst is H_2S and FeS. Hydrogen blistering is the result of atomic-hydrogen penetration, and the conversion of atomic hydrogen to molecular hydrogen at internal discontinuities within the steel.

"The amount of corrosion necessary to have an adequate supply of atomic hydrogen for hydrogen blistering is not known," they said.

How much does corrosion control cost on a pipeline? It's hard to figure, because each line presents its own problem. But engineers report that cathodic protection will cost about 3% to 5% of the total investment.

This means that on a pipeline that costs $5-million to lay, cathodic-protection service will cost about $150,000.

Of course, electrolytic installations that require their own generators to supply the direct current would cost more than a sacrificial-anode protection setup.

It is hard, also, to pinpoint the costs of coating and wrapping of a line. The cost will depend a good deal on the diameter of the pipe, the type of undercoating selected, and the type of wrapping required for the particular area. And coating and wrapping charges are figured as a part of laying costs.

But engineers say that the coating and wrapping costs are not of consequence, when compared with the outlay for the pipe which they help to protect.

In Refining:

Special Types of Corrosion Show Up

One Texas Gulf Coast refiner is forced to paint his exposed equipment every three weeks in his continuing fight against atmospheric corrosion and chemical vapor damage.

His preventive-maintenance efforts embrace processing units, stills, storage facilities, and exposed piping and manifolding. Every kind of paint tried by this plant owner has failed to stand up for more than three weeks, says a corrosion engineer familiar with the situation.

This refiner's problem may not be typical, but it's indicative of the role corrosion plays in the operation of refining and natural gasoline plants everywhere.

Refiners and gasoline plant operators face common problems, corrosion-wise. And they use much the same methods in combatting its effects.

Some refineries, of course, are faced with more serious corrosion problems than others, particularly if their facilities are used in processing sour crudes.

By the same token, the operator of a natural gasoline plant whose stream contains a large amount of hydrogen sulfide will have more of a corrosion problem than will a plant running primarily sweet gas.

Similarly, a refinery or gasoline plant that is located near salt water will have more of an atmospheric corrosion problem than will an inland refinery or gas plant.

Refiners and natural gas processors are faced with many special types of corrosion, such as hydrogen and caustic embrittlement of metals, stress cracking, impingement, and other damage to metals used in handling caustic solutions. The damage is caused primarily by electrochemical action, working in dozens of different ways.

A high concentration of hydrogen in a process stream may, under low-temperature, aqueous conditions, cause blistering of the refining vessels, piping, or other units. This blistering—really metal separation, in layers—will cause the steel to crack, resulting in complete rupture unless it is detected and remedied in time.

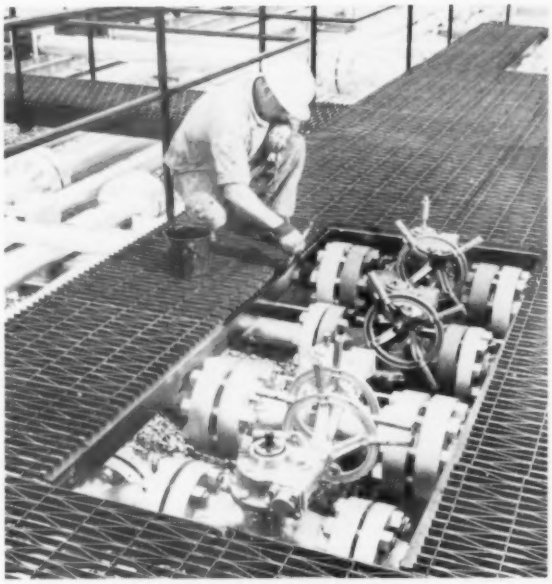
Caustic fluids, handled under high pressures and operating temperatures, offer a perfect entree to corrosive processes of various kinds within a plant.

As is the case with other divisions of the petroleum industry, refiners and natural gas processors have to employ many control methods. Moreover, since each refinery or gasoline plant is a separate entity, built to exacting specifications for a particular locality to process certain streams, no two plants are alike. Consequently, no two plants will have the same kind of corrosion problems.

A combination of coatings, inhibitors, and electrical protective systems are used by refiners and gasoline plant operators in their fight against corrosion.

Coatings have a wide application around the plant. They are used for underground and aboveground piping, for protection of storage facilities, both inside and out, for protection of towers, and for protection of processing units.

The coatings will range from common aluminum paint and coal-tar applications to plastics, resins, rubber, ceramics, cement, fibrous glass, silicones, and others. A proper painting program and continuous preventive maintenance are among the best corrosion-control methods known around the refinery and natural-gasoline plant.



CONSTANT PAINTING is needed around refineries to protect exposed metal from atmospheric corrosion.

Inhibitors also have a wide application. Says an engineer: "It is impossible to provide an inside paint job to a major-sized cracking unit. And it is equally impossible to provide cathodic protection around units that handle highly volatile fluids, where the electricity could cause fire and explosion. Therefore, the only thing that can be done, outside of using prohibitively expensive metal alloys, is to provide internal protection through the proper use of inhibitors."

The ease with which inhibitors can be put inside a flow stream or processing unit, plus the fact that they are relatively inexpensive and not dangerous to use, tends to make them popular for corrosion control around the plant.

Cathodic protection systems are also in use around refineries and natural gasoline plants, but mostly in nonhazardous areas, to give electrical protection against electrolytic corrosion.

According to M. J. Olive, a corrosion engineer for Arkansas Fuel Oil Corp., one of the "water-side" corrosion problems in gasoline processing equipment can be solved by "a practical combination of cathodic protection and water treatment."

He recently told the National Assn. of Corrosion Engineers in St. Louis that the use of small coated magnesium anodes has proven "very economical" in prohibiting cor-

rosion and scale formation in water boxes and floating heads of condensers and coolers. The method, he says, increases cooling efficiencies and prevents costly shutdowns, resulting in a decrease of water-treatment costs.

There are four main areas causing the largest expense and most headaches to plant operators, corrosion-wise, says Olive. They are:

- **External corrosion** of underground piping.
- **Atmospheric corrosion** around the cooling towers.
- **Product-side internal corrosion** of process equipment.
- **Water-side internal corrosion** of process equipment.

Pointing out that the entire plant operation is dependent on the quantity and quality of the cooling water, he warned that extreme care must be exercised in locating and maintaining an adequate supply at all times. Since water must be chemically treated for efficient operation, Olive estimated that the oil industry is spending more than $16-million a year to treat cooling water for scaling, fouling, and corrosion.

There are limits to cathodic protection around the plant. It cannot be used with absolute safety in certain hazardous areas.

A recent survey disclosed that 27 out of 31 refiners experienced corrosion difficulties due to hydrogen in their process streams.

E. B. Backensto, of Socony Mobil Oil Co., Paulsboro, N.J., in reporting on the survey to the American Petroleum Institute's Refining Division in Philadelphia, said, "A survey of 31 companies, representing experience on all types of commercial catalytic reforming units and desulfurizers that use hydrogen, revealed that the most frequently-encountered difficulties related to corrosion were excessive metal loss; heavy scaling of furnace tubes, exchangers, and transfer lines; plugging of catalyst beds; and fouling of heater and exchanger tubes."

The most widely-used methods for combatting or controlling corrosion of this nature, says Backensto, are: (1) proper alloying, generally with 18-8 chromium-nickel stainless steel at high temperatures; (2) feedstock desulfurization; (3) hydrogen sulfide removal in recycle gas; and (4) aluminizing.

The significant findings of the panel that conducted the survey were as follows, Backensto reported:

- All correlation charts, which were presented independently, agreed reasonably well on the corrosion rates to be expected with literature now available on corrosion-control in various catalytic reforming processes.
- Early corrosion experience with catalytic reformers indicated a new and severe type of attack. But subsequent developments showed that metal loss from this attack was not so serious as anticipated.

Interference of corrosion products with continuous-unit operation was the major difficulty. Both of these problems were solved mainly by feed desulfurization and materials selection.

- To eliminate scaling problems in low- and intermediate-alloy-steel furnace tubes and hot transfer lines, the combination of sulfur in the charge (calculated as hydrogen sulfide) and sulfur in the recycle gas should be below 0.006% to 0.01% by volume.
- The adherence and protective nature of the scale found in catalytic reformer corrosion was much less than that of sulfide-containing scales that were found in other conventional petroleum processes. This results from the effect of hydrogen on the composition of the scale, and freedom from coke during operations.
- Hydrogen, in major amounts, is present in most gas streams. The selection of metals for elevated temperatures must be made with this in mind.
- At low temperatures, where aqueous condensation can occur, conditions appear to be favorable for chemical attack which may lead ultimately to hydrogen blistering and embrittlement.
- Chlorides, which may be present in the system from several sources, can cause serious hydrochloric acid condensation-type corrosion.
- Austenitic stainless steels offer the best resistance to high-temperature hydrogen and hydrogen sulfide corrosion.
- If 18-8 chromium-nickel steels are used, suitable precautions must be taken to avoid corrosion and metal deterioration under shutdown conditions, cracking, and other difficulties.
- Fouling, by itself or in combination with corrosion, has been serious in many reformers. Fouling of exchanger bundles, primarily near the vaporization point, appears to be related to the dissolved oxygen content and sulfur compounds. Elimination of oxygen by conventional means, however, has not always alleviated fouling.

Control of sulfide corrosion in cat reformers can be gained by proper control of the ratio of hydrogen sulfide to hydrogen of the vapor stream, by separation of naphtha and hydrogen-bearing streams, by selection of suitable alloys or coatings, and by using inhibitors, say engineers.

Andrew Dravnieks and Carl H. Sammans, of Standard Oil Co. (Ind.), said at a recent A.P.I. meeting that control of sulfide corrosion in Ultraformers is desirable to increase equipment life and to prevent pressure drop across the catalyst bed caused by dislodged corrosion products.

In most platinum-reforming processes, they said, the clogging of fixed catalyst beds by corrosion products is more troublesome than the corrosion itself. The general corrosion product, ferrous sulfide, is quite porous, and will occupy a volume 2.6 times that of the iron corroded. Moreover, for every pound of steel corroded, 1.58 lb. of FeS will be formed, the engineers said.

Decreasing the sulfur content of the reactor will decrease the corrosion and scale resulting therefrom. And use of some type of alloy for the shell material may be desirable to guard against hydrogen attack in case of a local lining failure, or greater thermal conductivity than was expected.

Plastic pipe is not widely used because of its cost, but newer types show great promise, says a Mid-Continent engineer.

Thin-wall steel pipe costs one-fifth as much as plastic pipe—a major consideration in refineries and natural gasoline plants, where pipe is used so extensively. Coated internally and externally with enamel, this steel pipe has an estimated life of 10 to 20 years, he says. In "hot spots," cathodic protection can be applied.

But the new 2-in. and 2½-in. rolled plastic may give thin-wall steel pipe competition. The two cost about the same, this engineer says.

"Its primary advantage is its light weight and ease of laying. It costs a lot less to lay than steel pipe, and gives good protection in the handling of caustic fluids."

Offshore and Marine:

Salt Water, Air Are Big Hazards

Producers of oil and gas offshore, operators of pipelines to offshore structures, and owners of tankers and floating tansportation equipment all face a common problem: severe corrosion of metals exposed to salt water and air.

Many oil producers were alert to the possibilities of severe corrosion when they first started drilling for oil and gas in the Gulf of Mexico back in 1947. They soon learned that their worst fears were well-founded: The salt spray, wind, and water set up chemical actions which ate through steel piling, substructures, and other permanent platform installations.

Pipeline operators had a similar experience as they began building offshore crude and gas lines. For most ship and barge owners, however, corrosion was an old story; its effects had been well-known since the first vessel built of iron was launched long ago.

Control of the offshore corrosion problem, with respect to producers, lies generally in the fields of (1) protective coatings, particularly plastics, (2) cathodic protection, and (3) alloy-metal cladding at critical points.

One big operator offshore says that the two greatest corrosion problems encountered in the Gulf of Mexico are atmospheric and chemical corrosion. Progress is being made, however. This company says that by using Shell's Epon resin coatings offshore, it expects to have its permanent drilling and producing structures last "at least 20 years, with only touch-up maintenance."

Initial cost of Epon coating is higher than conventional alkyd coatings. But Epon has an added advantage of high abrasive resistance. Another advantage is that it can be patched easily.

Cathodic protection is used widely to protect permanent offshore structures from chemical corrosion. The steel piling, pounded into the ocean floor, sends out electrical currents into the salt water, which acts as an electrolyte.

The corrosive action set up is similar to damage to a pipeline buried under the ground. Therefore, sacrificial anodes, usually of magnesium, are installed to protect the piling (page 34).

In the critical "splash" or spray zone, where the tide rises and falls, and the steel piling is constantly besieged by salt spray and wind, many operators turn to Monel sheathing. This sheathing is highly resistant to atmospheric and chemical reactions.

Underwater pipelines can be protected against salt-water or marine-organism damage by proper coating and wrapping materials. These may include thick coatings of concrete-like materials, or special rubberized plastics.

The thick coatings not only serve to keep out moisture and protect the pipe from both chemical and electrical corrosion, but they also give the pipe the added weight needed to keep it on bottom.

A special coating, called "Timcoat," a tough, pliable rubberized-asphalt mastic, is said to give extremely good protection against corrosion and marine life (PW—Nov. 30'56,p23). Brown & Root, Inc., owns the patents on it.

UNDERWATER PIPE must be well wrapped to protect it against salt-water or marine-organism damage.

Several companies are now engaged in extensive corrosion research covering tankers and other floating equipment. This speedup seems to stem from the handling of increasing amounts of sour crudes, which are being moved to East Coast refining areas.

One company has started keeping detailed records on each of its tankers. The company has installed magnesium anodes in the ships' tanks to provide cathodic protection, installed dehumidifiers in the tanks to reduce moisture content, and also has used coatings of various types on the inside tank walls to reduce the corrosive effects of high-sulfur crudes.

Test panels on each ship are coated with epoxy resins. Tentative results look "very good," the company says; protection appears to be better than that given by magnesium anodes.

The company also is testing out new chemical additives, which are dumped into the ships' tanks as they take on sour crudes.

The additives are thought to inhibit the metal tanks against corrosive effects of the crudes.

One of the big problems facing the company, in its testing of these inhibitors, is: What happens to the additive when the crude is run through the refinery? This involves such other questions as, "What harm, if any, do the additives do to the product being produced?" and "Where (at what product boiling range) do the additives come out?"

So far, chemical inhibitors appear to have no adverse effects on products, based on tentative results. Part of the research with use of inhibitors concerns, of course, the economics of using them to treat a whole crude stream, such as a full tanker load.

One company's tests show that a tanker hauling rela-

tively high-sulfur crudes on a single voyage will lose as much as 76,000 lb. of metal from the inside of its tanks.

The lost metal is valued at about $2,500.

Dehumidifiers in the tanks provide the best means of cutting this loss. Dehumidification may prove to be more effective in combatting corrosion from sour crudes than is anodic protection, says the company.

The U. S. Navy reports that it is licking this problem with a protective tank coating called Saran, a vinylidene chloride-acrylonitrile copolymer resin, dispersed in a methyl ethyl ketone, pigmented to either a white or orange color (PW—May24'57,p31). The Navy has proved Saran will stand up under corrosive action in marine use on oilers, tankers, submarines, and icebreakers, and onshore at a tank farm in Guam. The material is applied quickly and dries promptly. It is not affected by the fuels carried, nor does it contaminate the fuels. Other advantages: Saran cleans easily and is unaffected by hot-water sprays.

In Marketing:

Damage to Tanks Biggest Headache

The marketer has the easiest time of all when it comes to fighting corrosion.

Most of his equipment is above ground and is subject primarily to external corrosion. This can be combatted through routine painting programs. And, in the case of service stations, the marketer's desire to keep his stations attractive usually means that they are repainted more frequently than is necessary for corrosion protection alone.

Nevertheless, marketers are engaged in constant search for new means of reducing corrosion damage. Particularly, they seek coatings that will stand up in the presence of petroleum products—at a feasible price.

One reason for this concern: Increased use of additives in gasoline and fuel oils is adding to the corrosion problem, marketers say.

Damage to tanks at bulk stations is experienced—but effective protection often costs more than it is worth.

One major East Coast marketer contends there simply is no way to prevent external corrosion of steel tank bottoms at bulk plants. Protective coatings are used at the time such tanks are installed. And experience has shown him that these bottoms last 25 to 30 years. When one corrodes through, a new bottom is dropped in the tank and welded in place.

"This is the cheapest and longest-lasting method," he asserts.

Storage tanks often are deliberately provided with a 3-in. water-bottom. Then, if a tank does spring a leak at the bottom (the most vulnerable area) water rather than valuable product is lost.

In such circumstances, a sodium nitrite inhibitor may be added to the water to prevent severe pitting of the steel plates. It is added to the tanks at a ratio of about 5% by weight to the bottom water, and is not a costly operation.

Internal corrosion can be reduced by periodic cleaning of the bottoms to remove impurities that inevitably collect there.

In certain areas, atmospheric conditions are a serious cause of external corrosion. Chemical fumes are a prime offender, so bulk storage facilities located near chemical plants and steel mills must be effectively and continually protected with paints and coatings.

The biggest corrosion problem for marketers involves underground storage tanks at service stations. Cathodic protection is the best preventive here.

In most instances, galvanic protection, achieved through use of magnesium anodes buried around the tanks is effective. Occasionally, at locations such as those near electric transmission lines, it is necessary to install a rectifier to provide induced current (electrolytic protection).

Here again, the cost element enters the picture. One company has conducted extensive studies and found that the average life of such tanks is 15 to 20 years. It also has found that if a tank lasts ten years or more, cathodic protection is uneconomic. Consequently, it does not make widespread use of the system.

However, cathodic protection is used in areas where experience shows it to be advisable, or conditions favorable to electrolytic corrosion are known to exist.

For other equipment—such as buried pipe or vehicles—corrosion is of minor consequence.

In the case of pipe used in bulk plants and around service stations, the cost of cathodic protection isn't justified by the need. Consensus is that "the pipe lasts long enough."

Coatings have been tried on tank trucks and other vehicles, particularly on the interior surfaces of those handling chemicals. Ethylene-based coatings, reportedly have been eminently successful in preventing corrosion. Generally, however, it is found that the vehicle wears out or becomes obsolescent before it becomes a victim of corrosion, so no protective action is warranted.

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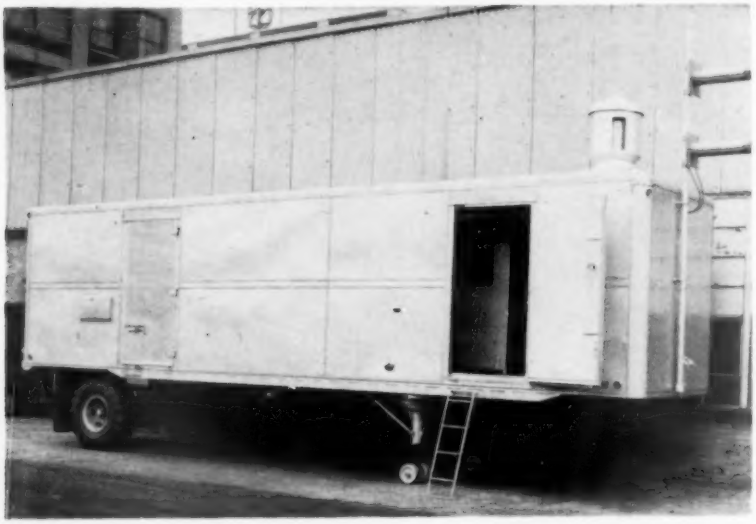


VAN HOUSES INSTRUMENTS needed to run remote pump stations as Aramco's . . .

Crude Line Gets Mobile Controls

Arabian American Oil Co. and Trans-Arabian Pipe Line Co. are getting mobile instruments to monitor and control the portable pumping stations they are installing on their crude line from the Persian Gulf to the Mediterranean port of Sidon, Lebanon (PW—Jun.15'56,p44).

The pumping stations, supplied by International General Electric Co., are now being installed. They use gas turbines, powered by crude oil taken directly from the line. In all but one installation, IGE also is providing the control equipment.

At one location, however, the controls are being furnished by Union Switch & Signal, a division of Westinghouse Air Brake Co.

Union has mounted one of its Centralized Transport Control systems in a large trailer (picture), which will be "parked" at Tufaih, in Saudi Arabia. The CTC system includes electrical instrumentation, data processing units, tone shift terminals, UHF radio equipment, and monitoring and control equipment.

Parked next to it, on Aramco's feeder line to the Trans-Arabian crude trunk, will be a 5,000-hp. gas turbine, a crude oil pump, combustion air filtering equipment, measuring instruments, turbine sequence control, and generator.

This equipment, except for the turbine, is also housed in mobile vans. And duplicate foundations and pipeline manifolding enable the turbine to be replaced quickly by a "spare" in the system—and trucked to Aramco's maintenance shops in Abqaiq, if necessary.

This combination of portable pumping equipment and portable controls is unique in scope in the industry.

The emphasis is on portability because the company is trying to get away from keeping manpower in the hot, dry desert—even for maintenance.

The original stations on the Aramco and Tapline system were built for manual operation, and provided with water and all of the equipment and services required to keep men reasonably comfortable. But when the present expansion program was being plotted, the companies decided that the necessary new horsepower could be obtained with turbines. These could be controlled remotely and, at the same time, would be compact and light enough to be trucked to civilization for overhaul or major repairs.

All equipment in the new control van is glass-enclosed, with cabinets sealed against dust intrusion.

Even severe sandstorms will not affect the delicate instruments, according to Union Switch & Signal. And the equipment is designed and tested to operate efficiently in temperatures that often soar to 135F.

The portable satellites will be controlled remotely. For example, in the case of the Tufaih station, operations will be controlled from Aramco headquarters at Abqaiq, via a UHF system.

The base station control cabinet includes function switches, visual and digital readout of telemetered information, and automatic printout to provide a permanent record.

The variables to be telemetered include suction and discharge pressure, discharge pressure controlled set-point, turbine inlet air temperature, and turbine speed.

The information can be broadcast automatically to the base station at set intervals, or the base station operator may get the information on demand by pushing a button.

At Long Last: Gas Wells to Get Outlet

Contracts have been let for the final segments of a 350-mi. gas pipeline that will provide a market outlet for the long-idle gas wells in Wise, Parker, and Jack Counties, in North Texas (PW—Dec.14'56,p15).

Natural Gas Pipeline Co. of America is building the line from Bridgeport, Tex., northward into Oklahoma, then west to tie in with Natural's existing line at Fritch, in the Texas Panhandle.

Work already is under way on the first segment, a 65-mi., 20-in. line from Bridgeport, into Oklahoma. Eastern Pipeline Contractors, Dallas, holds the $4.5-million contract. Completion is scheduled by mid-October.

Construction will start late this month on the three remaining segments, costing an estimated $17,424,000. These all involve the laying of 26-in. line. H. B. Zachry Co., San Antonio, holds the contract for one segment; River Construction Corp., Ft. Worth, has the other two.

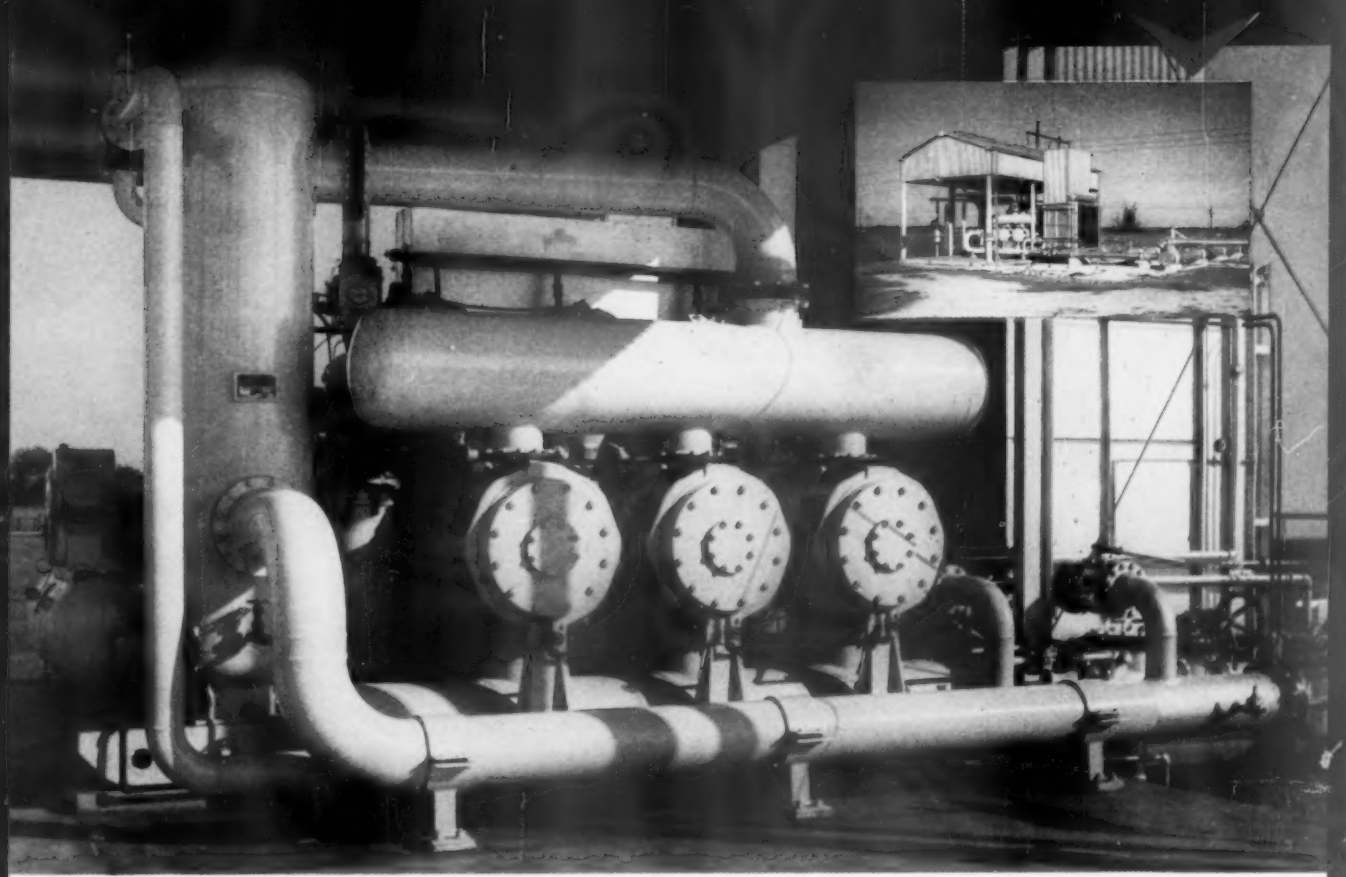
The entire project, costing upward of $32-million with equipment and gathering systems, will be finished by mid-November.

The line will have an initial capacity of 240-million cu. ft. a day.

Three gas purchase contracts have been made, providing for initial delivery to Natural of some 78-million cu. ft. a day. Largest of these is with Christie, Mitchell & Mitchell, of Houston (PW—Sep.28'56,p22). Others are with Warren Petroleum Corp. and Sunray Mid-Continent Oil Co., both of Tulsa, and Oil Drilling, Inc., et al, Houston.

More than 120 gas wells have been completed in the three-county area, but all have been shut in for lack of an outlet. Gas reserves dedicated to the line are estimated at more than 750-billion cu. ft.

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



UNITED GAS PIPELINE COMPANY'S Monroe Field Station No. 1 equipped with a Beaird-Ingersoll-Rand 6SVG 330 h. p. packaged compressor complete with all necessary controls for unattended operation. Other sizes from 120 to 660 h. p.

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UNITED GAS PIPELINE COMPANY has installed this Compressor Station near Sterlington, Louisiana. Equipped with a Beaird-Ingersoll-Rand 6SVG 330 h.p. packaged compressor, the station is an integral part of United's Monroe Field facilities. Gas from declining wells in the field are boosted from 10 psig to main line pressure of 25 psig. Ten million cubic feet per day are handled by this single Beaird unit.

Designed for unattended operation, the compressor is equipped with regulators that enable the driving engine to throttle from half to full speed to maintain constant discharge pressure. Should operating conditions become less stable, compressor valve unloaders can be installed which will provide completely automatic operating control. The compressor will then unload its cylinders in steps, maintaining precision discharge pressure to the main line. When the condition causing the pressure build-up is eliminated, the unit would automatically close the unloading valves and pick up the required load.

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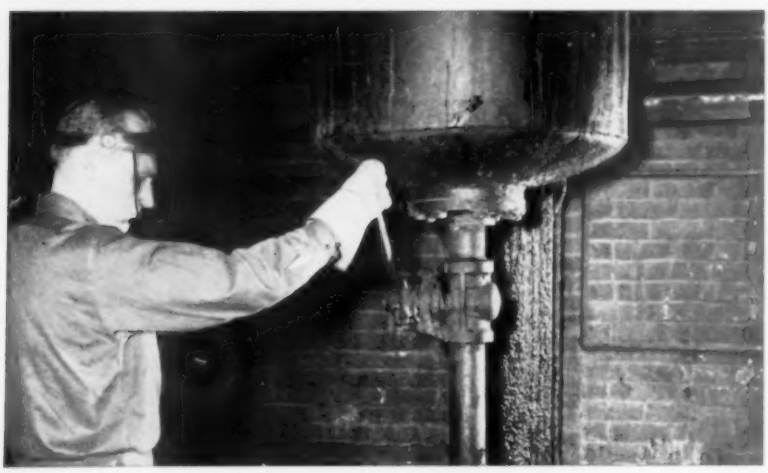

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What's New IN TRANSPORTATION

Seek Billing Change

Two pipeline subsidiaries of the Peoples Gas System are seeking changes in their procedure for billing utility customers.

Texas Illinois Natural Gas Pipeline Co., one of the subsidiaries, sells most of its gas to the same utilities supplied by Natural Gas Pipeline Co. of America, the other subsidiary.

They want Federal Power Commission approval of a plan by which Texas Illinois would sell all of its gas to Natural, which in turn would resell it to present Texas Illinois customers.

Texas Illinois would bill Natural on a "cost of service basis." Utility customers of Natural would be billed at uniform rates. These rates are designed to recover its additional cost of service, including a 6½% return on projects to be completed in 1957, increased operating costs of property now in service, and cost of gas bought from Texas Illinois.

The proposals would raise annual revenues of the two lines by about $6.5-million.

•

Two 65,000-ton supertankers will be built in Japan for Overseas Tankship (U.K.), Ltd., of Great Britain, affiliate of the Caltex group.

They will be built at the Innoshima Dockyard of Hitachi Shipbuilding & Enginering Co. Cost of the two will be $27-million. Each will be 778 ft. long and will be powered by 23,000-hp. turbine engines made in Japan, giving maximum speed of 17 knots. The contract contains an escalator clause covering any rise that occurs in material or labor costs.

•

First of ten tankers for Gulf Oil Corp.'s new domestic fleet was launched this week at Bethlehem Steel Co.'s Sparrows Point (Md.) Shipyard. This tanker, the Gulfking, and three successors will be 32,650-tonners. Six more will be of 29,000 deadweight tons. Total cost: $114-million.

•

Construction will start late this month on a 341-mi., 20-in. gas pipeline from Toronto to Montreal. Officials of Trans-Canada Pipe Line Ltd. expect the $20-million line to be completed by Nov. 1.

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Egypt 'Settles' Six-Year Price Row

CAIRO—The six-year price dispute between the Egyptian government and oil marketing companies in Egypt has been settled, in the opinion of Egypt's Minister of Industry Aziz Sedki.

The Minister claimed the settlement had been made "in a manner satisfactory to all concerned and in conformity with the government's views."

The first agreements were signed between the government and Esso Standard and Caltex (Egypt) SAE, settling their accounts under the stabilization fund. Similar agreements will be signed with other companies soon, the Minister said.

Negotiations are now in progress to settle accounts with Mobil Oil (Egypt).

The settlements, which Dr. Sedki said were made in the government's favor, were actually a compromise. The government made cash payments that were far short of company claims. Nevertheless, the amounts Esso and Caltex cashed were higher than the amount the government had insisted all along was a fair settlement of its debts.

Esso got nearly two-thirds of the $2,050,000 it claimed, and Caltex got nearly half of the $6,160,000 it claimed.

The complicated formulas devised by the government to pay its debts to Esso and Caltex differed considerably. At first, government negotiators wanted to pay both Esso and Caltex on the same basis. Had this been the case, Caltex would have received only 10% of what it claimed.

Caltex's case was different from Esso's. Esso markets on its own account in Egypt. Caltex, on the other hand, distributes products through its agents, Societe Egyptienne des Petroles (SEP).

The dispute over petroleum product prices has been going on since 1951 through various regimes and administrations.

In 1954 the government announced a tentative agreement under which oil companies would be able to make a 7½% profit by underselling kerosine (Egypt's No. 1 household fuel) and overselling gasoline.

In practice, however, it didn't work. In September, 1956, the government decided to call off the price-stabilization agreement. The net balances due from the government to the oil companies at that time were: $6.5-million to Shell Oil (Egypt); $1.5-million to Mobil Oil (Egypt); $160,000 to Egyptian Independent Oil Co. (a local company); and the amounts now settled with Caltex and Esso.

(Shell Oil Co. of Egypt has been virtually nationalized since the government took it over as enemy property after the British-French attack on the Suez Canal last November.)

The government announced a new marketing plan last September. It decided it would import all the oil, then give it to marketers to sell, with a fixed profit margin for each petroleum product.

Oil men complained that the new plan gave an unprofitably low margin—so low it was impossible to operate. It gave as little as 2% to some companies (whose expenses were not high), while other companies actually had to operate at a loss.

Some company men thought they could keep on operating in the country had they been allowed to market their own products—by importing Saudi Arabian crude. Due to Egypt's lack of dollars, however, the U.S. companies were actually forced to market Russian and Rumanian oil.

The companies refused a government offer to settle at half the amount the companies claimed. They insisted that the government should pay at least what it had agreed were legitimate expenses of the companies.

At that time, some company officials felt there was nothing more left for the foreign companies to do but pack up and go home.

The government has now also agreed to import more Saudi Arabian crude for marketing by U.S. companies.

Thus, the new Mex refinery, near Alexandria, in which Caltex has a minor share, will now process only Saudi Arabian crude.

A Setback for Petrobras?

RIO DE JANEIRO — Petrobras, Brazil's government oil monopoly, appears to be suffering a setback in political prestige as a result of current negotiations in La Paz over Brazilian oil development rights in Bolivia. This might strengthen chances for private enterprise in Brazil, according to political observers here.

Brazil's rights were set up under a 1938 treaty. It called for Brazil to build a railroad—which it did—in return for the privilege of oil exploration rights in a chunk of land, smack in the middle of what is supposed to be the best oil country in Bolivia.

The area covers some 12,350 sq. mi. of wild country in northeastern Bolivia. It includes some of the acreage that Bolivia expropriated from Jersey Standard in 1938, when it nationalized its oil industry.

Nothing was ever done about activating the treaty rights until last year, when Bolivia began pressing for some action.

Petrobras was not supposed to enter into the oil negotiations with Bolivia, because the Bolivian constitution specified that no foreign government oil company can explore on Bolivian territory.

So Brazilians started lining up private interests to undertake the venture for Brazil (PW—Mar.22'57,p71).

Under the angry insistence of Col. Janary Nunes, president of Petrobras, officials of Petrobras—and Nunes himself—were included in the recent delegation to Bolivia. Petrobras then began to insist that it was to do the exploring, not a private Brazilian company.

The Bolivians, according to sources close to the Brazilian delegation, were adamant in their demands: Petrobras was not to come into Bolivia under any circumstances.

Because of Petrobras' predominance in the meeting, negotiations began to lag.

Col. Nunes has now returned from the talks, even though the negotiations are still under way. Nunes says that "negotiations are continuing in a friendly and cooperative manner."

But Rio circles interpret this statement, and his early return, as a reluctant admission of defeat, which could have later repercussions for Petrobras' prestige and political power in Brazil.

Now there appear to be only two

possibilities for the outcome of negotiations:

- **Either the Bolivian delegation will denounce the whole deal because Brazil has not done any active work to explore the territory** (some Bolivian government officials have unofficially suggested this already).

- **Or some Brazilian private group will be allowed to form a company to explore in Bolivia,** perhaps with some Bolivian interest, and a minor American-company interest to supply technical assistance and operating equipment. One such group might be the Capuava refinery group, or one of the other four or five Brazilian groups making proposals.

The latter of the two alternatives is believed to be the more likely, according to top Brazilian government sources, because it is unlikely that Bolivia would make an outright breach of a treaty with Brazil.

If a private oil group did find oil in Bolivia, and was in a position to pipe it eventually into Brazil—then Petrobras could look bad back home.

Brazilians might ask: If one of our private companies was so successful in Bolivia, why not give it a try here in Brazil? This possible outcome is exactly what Petrobras was fighting to avoid in its urgency to dominate the La Paz talks.

Col. Nunes' return from Bolivia has come at a time when some local newspapers in Rio and Sao Paulo are going heavy on campaigns against "statism" and "threat of government monopolies."

Correio da Manha—Rio's biggest morning paper—has been lambasting Kubitschek's government and, in particular, such government agencies as Petrobras. The paper has come up with a growing list of economists, senators, deputies, and heads of trade and industrial associations to join its printed attack on government intervention in private business.

One of the big guns in this attack is Janio Quadros, the governor of powerful Sao Paulo state. He has said that he cannot condemn Petrobras' efforts as such, but that the oil monopoly just doesn't seem to be working fast enough to meet Brazil's economic problems. Quadros was the first big-name public official to criticize Petrobras publicly —with the exception of Ambassador Assis Chateaubriand, who has been doing so without much effect for years.

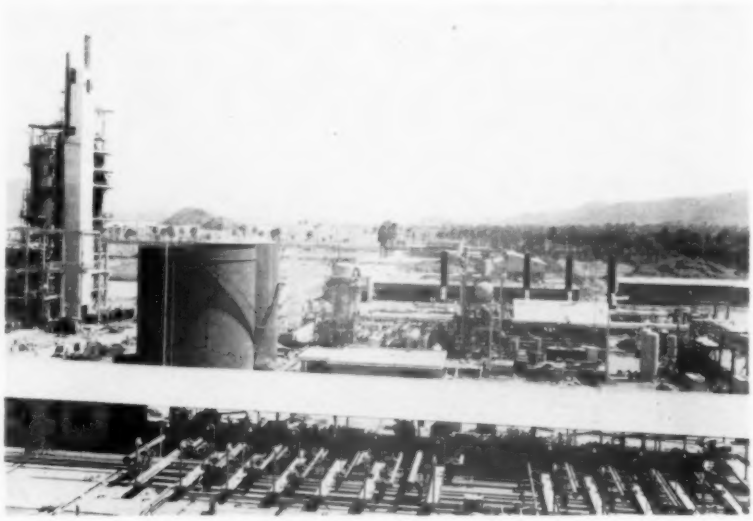
Rio's biggest evening paper, O Globo, had a front-page editorial against Petrobras.

On the surface, it appears that Petrobras is unruffled by this latest flurry of attacks. Just a few weeks ago, Col. Nunes was able to influence President Kubitschek to reverse a decision made by the National Petroleum Council (which is supposed to set oil policy).

More efficient operation recently has enabled the Capuava refinery to boost its output. The private group that operates the plant wanted the government to boost its quota accordingly, so that it could market the extra output. The council agreed. But now, due to the President's reversal of that decision, the refinery has to sell its extra production to Petrobras on Petrobras' own terms.

Sources close to Petrobras and the government claim that Petrobras' "facade" looks strong, but things are beginning to happen within the company that shows signs of weakness.

The Bolivian setback, and the growing number of attacks from newspapers and public officials, all add up to a feeling of tension and insecurity within Petrobras' ranks.



VISAKHAPATNAM, on the east coast, is where Caltex Oil Refining (India) Ltd.'s . . .

India Refinery Is Coming on Stream

BOMBAY—India's fourth refinery, and its first on the east coast, is now coming on stream at Visakhapatnam, halfway up the coast on the Bay of Bengal.

India's oldest—and smallest—refinery is Assam Oil's plant at Digboi, in the northeast corner of Assam. It handles 7,500 b/d of local production from the Digboi field. The two other refineries are Burham-Shell's 40,000 b/d refinery at Trombay, and Stanvac's 27,800 b/d plant at Bombay.

The new 13,500 b/d plant was built by Caltex Oil Refining (India) Ltd. (CORIL) at a cost of $29-million.

The plant has four major processing units: crude distillation, decarbonization, fluid catalytic cracking, and polymerization. It will provide gasoline, kerosine, diesel oil, and fuel oils necessary for eastern India's industrial growth.

The crude distillation unit was put into operation toward the end of 1956.

Shown in the picture (above): at the far left, the cat cracker; in the foreground, the transfer pump house; in the background, the boiler and water treating plant; and in the distance, the cafeteria and office buildings.

Products will be principally marketed in the state of Andhra, where the refinery is situated. Crude will be supplied from Caltex's Sumatra fields. Distribution will eventually be broadened to take in all of Caltex's outlets in India.

A 1,200-ft.-long oil berth is now under construction at Visakhapatnam, and the harbor will be dredged to a depth of 35 ft. to permit tankers to unload crude at the refinery. Visakhapatnam is now the second largest port on the eastern seaboard.

Caltex is training a group of local employees and graduates of the State university, at its Batangas refinery in the Philippines. There, they will receive additional training in refinery operations.

What's New / AROUND THE WORLD

New Suez Plans

CAIRO—Egypt is now drawing up new proposals on the projected Suez pipeline. They will be presented to world oil marketing concerns and Aristotle Onassis next week, according to Hassan Ibrahim, chairman of the State Economic Organization.

The Cairo radio says Egypt turned down Onassis counterproposals because "Onassis wanted exclusive control of operations" (PW—Jul.12'57, p33).

•

Bid for Iran Rights

IRAN—Two U.S. oil companies—and one Italian—have completed negotiations with Iran for oil rights, according to Abdollah Entezam, general manager of the government's National Iranian Oil Co. The companies were not identified, though the Italian firm is reported to be AGIP, subsidiary of Italy's government-owned ENI, which earlier negotiated a 50-50 deal with Iran (PW—Jul.5'57,p36).

Last week Iran's new liberalized oil bill was passed by the Majlis (Parliament). The new law enables foreign oil companies to bid for "independent" oil development rights by offering bonuses (PW — Jul.12'57,p34). However, the acreage limit in this case—2,059 sq. mi.—is lower than in a 50-50 partnership arrangement with NIOC.

The new law also offers two other methods of foreign operation in Iran: either a full 50-50 partnership with NIOC, or a partnership arrangement in which NIOC would have an interest of between 30% and 50%.

If a foreign company accepts a 50-50 arrangement, it could get exploration rights over a maximum of 3,088 sq. mi. in each petroleum district of the country. If NIOC has a minor partnership, the acreage limit is smaller.

•

PARIS—The French government will float a bond issue in September to help cover the cost of Sahara development, according to Sahara Minister Max Lejeune. Lejeune just returned home from a trip to the desert region. Around $1-billion would be needed in the next three years to develop existing resources, he indicated.

Lejeune said—when questioned about foreign participation in the Sahara—that the law setting up a common organization gives him, as head of the organization, the right to negotiate with foreign groups for loans or participation. He emphasized, however, that these companies would have to set up subsidiaries incorporated under French law. No foreign interests, he added, have yet officially asked to participate.

Reportedly, only a handful of U.S. oil independents and majors are watching the French government's progress in setting up conditions for foreign companies to operate in the Sahara. They include Newmont Oil, the Feldman interests, Conorada, Cities Service, Sun, Tidewater, Jersey Standard, Socony, and Caltex.

•

CARACAS — The new Aguasay trend in eastern Venezuela has been extended 7½ mi. by a Mene Grande Oil Co. discovery in Anzoategui state. Length of the trend is now about 17½ mi.

The company's No. ZG-201-X flowed 500 b/d of 39.4-gravity crude through ¼-in. choke in a completion test of an 11-ft. section of U-2 sand. Depth was approximately 12,000 ft.

The well was spudded in in late March. It is 7½ mi. west of Mene Grande's No. 1 Zulus, and 17½ mi. west of Sinclair Oil & Refining Co.'s discovery well, No. 3 Aguasay, across the state border in Monagas (PW—May3'57,p50). Originally known as No. 1 Zarza, the wildcat was carried to a depth of around 13,000 ft.

Meanwhile, a new 8-in. pipeline has been put into operation, carrying Aguasay crude from the field to Puerto La Cruz. It is wholly owned by Venezuela Petroleum Co. (Sinclair).

•

GUATEMALA—The first wildcat ever drilled in Guatemala is slated to be spudded in on July 26. Sloane Exploration Co., Houston, and Southwest Oil Corp., New York, reportedly have joined forces to drill the test.

Last week operators completed loading drawworks and other equipment for drilling the wildcat down to a possible 6,000 ft. on the first of four concessions they hold in eastern Guatemala (PW—Jun.28'57,p44).

A Sky Top 7,000-ft. rig, purchased from Colby, Inc., Houston, will be used.

An application has been filed with the government to build a refinery in the event of a good discovery.

•

CAIRO—Another step may be brewing in Cairo's moves to mix oil, politics, and labor organizations. Egypt's semipolitical news agency reports that the International Federation of Oil Workers Unions has decided to set up a regional office in Egypt—a negligible oil producer—to "look after the interests of oil workers in the Middle East."

The agency (Middle East News) further reports that the bureau will be headed by Anwar Salama. A political appointee known to be unfriendly to Western oil interests, Salama is president of the Egyptian Workers Federations and also of the Egyptian Oil Workers' Syndicate. He attended the Rome meeting of the Council of the International Federation of Oil Workers' Unions, and was elected a vice-president of the international federation.

The new office will compile information and statistics on the Middle East countries' oil industries, and organize training courses for their oil workers, numbering about a half million, the agency said.

•

PANAMA—Cataract Mining Corp. has acquired an additional 3-million acres of oil and gas leases in the Provinces of Veraguas, Bocas del Toro, and Chiriqui.

This acquisition makes the New York company the largest holder of oil and gas concessions in Panama. Cataract had previously acquired over 2-million acres of concessions in the provinces of Darien and Chiriqui.

•

CARACAS—Mene Grande Oil Co. is building a $5.5-million pipeline and a new $4.5-million tanker loading berth in eastern Venezuela.

The new 42-mi., 16-in. pipeline will carry 150,000 b/d from the company's new Ceuta field in Lake Maracaibo to its terminal at Bachaquero on the eastern lakeshore.

Completion of the line, and 478,000 bbl. of additional storage capacity at Bachaquero, is scheduled for October.

The loading berth, with a dockside depth of 60 ft., will be built at the company's Guaraguao (Puerto La Cruz) terminal.

DEPT/Refining

Combine Cracking, Reforming?

● **It can be done: Universal Oil Products Co. has a new process combination designed to do it. And there may be good reason for refiners to adopt such a system soon.**

Universal Oil Products Co. has obtained a foreign patent on a unique new integrated cracking and reforming process combination.

UOP recently got a British patent on the system. However, the company has not announced its availability.

Basically, the UOP combination process technique was developed to improve catalytic cracking operations. It is said to overcome two disadvantages of current cat cracking processes: less-then-optimum utilization of charge-stock hydrogen, which results in product distribution and quality which is only "fairly satisfactory"; and a relatively low tolerance for charge stock contaminants, which limits the types of charge stocks that can be successfully processed.

The process is said to obtain good yields of "an excellent quality motor fuel and a high-quality, substantially-saturated, aromatic-free distillate"—without excessive consumption of external hydrogen.

UOP hasn't made known the octane rating of motor fuel produced in this process combination. It says only that the fuel has "outstanding antiknock rating". It also describes this gasoline as being made up chiefly of isoparaffinic and aromatic hydrocarbons characterized by low sulfur content and high stability.

Low content of olefins and other gum-forming materials, says UOP, is responsible for the fuel's high stability rating.

The reasons for the reported product improvement, according to UOP, are (1) a careful hydrogen balance throughout the process, and (2) better handling of charge-stock contaminants.

High-quality gasoline and distillates both have fixed ranges in hydrogen content.

If the hydrogen is distributed in correct proportion between the two, both products can be produced in good quality.

This hydrogen balance is what UOP is shooting at in integrating cracking and reforming operations.

The cracking step of the process, which uses a hydrogen fluoride catalyst, can reportedly operate on a wider range of charge stocks than other cat cracking processes.

The cracker, according to UOP, can handle topped crudes, reduced crudes, and similar charging stocks that contain appreciable quantities of contaminants. Other cracking processes, with lower tolerance for charge-stock contaminants, are more limited in the types of stocks they can handle.

UOP puts it this way: "A relatively low tolerance for charge-stock contaminants . . . deleteriously affects the activity and selectivity of the catalyst and . . . usually promotes excessive hydrogen formation."

The cracking reaction is carried out in a liquid phase at a preferred temperature somewhere between 200F and 500F.

Like all cracking processes that use hydrogen fluoride as a catalyst, the cracking process produces a substantial amount of tar or sludge—a catalyst-soluble diluent made up primarily of heavy hydrocarbon compounds. The sludge also includes sulfur and nitrogen compounds extracted from the charging stock. And the metallic compounds of the charge stock appear to be preferentially soluble in the catalyst; hence the ability to process even high-metal-content charge stocks.

The sludge is separated from the catalyst by distillation in another part of the processing system.

UOP adds: "It may be desirable to charge hydrogen and/or boron fluoride to the cracking zone. Hydrogen often tends to partially suppress sludge formation, and boron fluoride frequently modifies the activity and selectivity of the hydrogen fluoride."

The hydrogen fluoride catalyst makes for several corrosion problems not found in other cracking systems. Specially-designed corrosion inhibitors are therefore necessary in the cracker's vessels and piping, and in all other parts of the system contacted by the catalyst.

Some of the cat cracked fractions are suitable for gasoline blending. A good portion of the cracker effluent, however, is passed to a reformer for upgrading as gasoline components.

The reforming step of the process uses a precious-metal catalyst for dehydrogenation of naphthenes fed to it by the cat cracker.

Any reforming catalyst suitable for dehydrogentation of naphthenes can be used in the reforming step of of UOP process. As a "particularly suitable catalyst," UOP singles out one "which comprises alumina, platinum, and a combined halogen."

After reforming, the converted gasoline hydrocarbons are highly-aromatic, with "outstanding antiknock rating."

Temperature for the reforming operation, depending on the type of catalyst used, will range from 600F to 1,000F.

Under such conditions, with a charging stock containing an appreciable amount of naphthenes, there is a relatively large net production of hydrogen.

Free hydrogen given off in the reforming operation is used to purify the spent hydrogen fluoride catalyst for the cracker.

Hydrogen given off in the reforming operation is passed to a catalyst-hydrogenation reactor. With boron fluoride acting as a promoter, the hydrogen contacts spent hydrogen fluoride catalyst from the cat cracker in a liquid phase and dissociates the catalyst from its hydrocarbon impurities.

The purified hydrogen fluoride catalyst is then returned to the cracking reactor for reuse in inducing the cracking reaction.

The role of the new combination process in future refining is still unclear.

Such a direct tie between cracking and reforming is, at this point, only theoretical. No processing plant has ever operated in this way. And UOP has announced no licensing of the process.

So refiners that become interested in the combination will be stepping into virtually unexplored waters.

Still, there may be enough inducement to do so. The combination's reported ability to handle charge stocks with a relatively high contaminant level will make it attractive to refiners.

The system's "hydrogen balance" will also give refiners something to think about. The use of hydrogen in processing has been growing steadily in recent years.

If refiners can be convinced that the system offers a better hydrogen management, which results in "outstanding product distribution and product quality"—as UOP claims—they'll really be interested.

More Steam with Fewer Dollars

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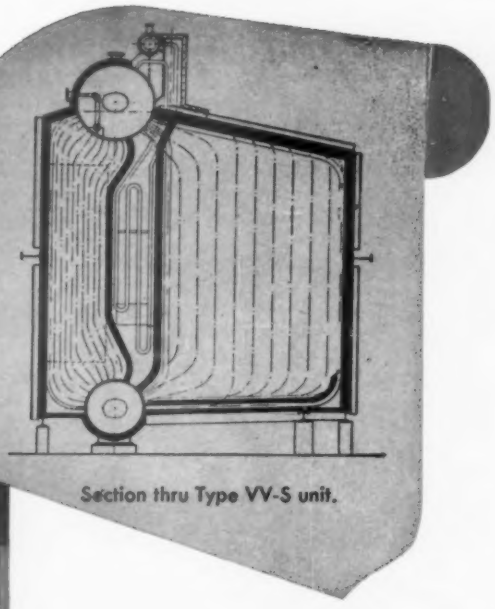
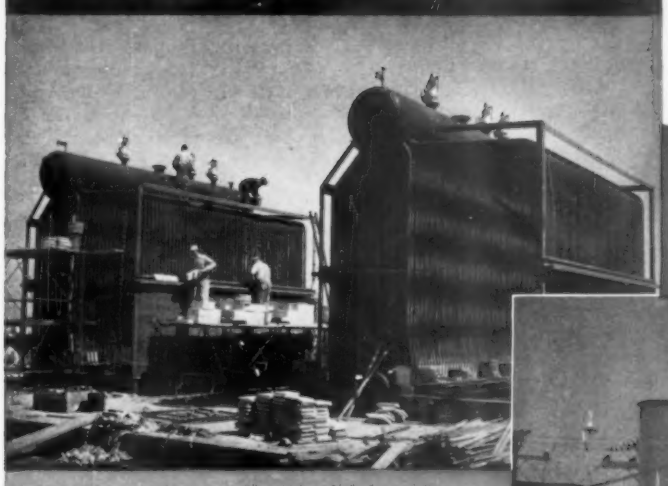
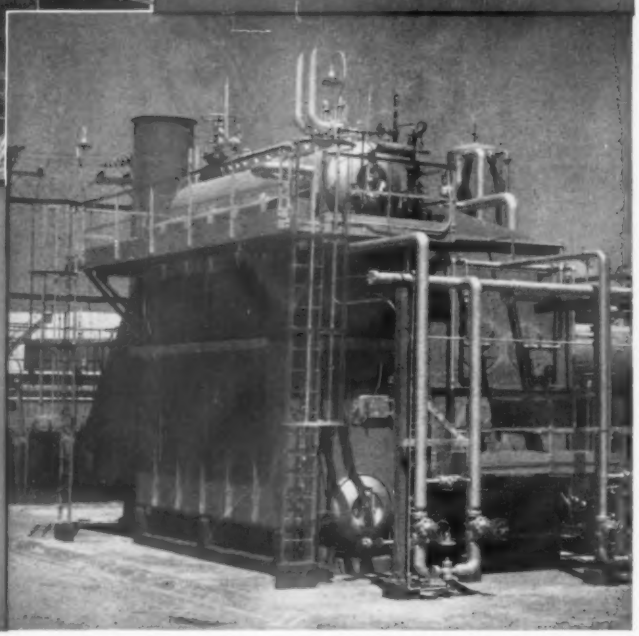


Section thru Type VV-S unit.



Two 50,000 #/hr. units under erection at an Air Force Base.

A 65,000 #/hr. unit in a Texas Petroleum Refinery



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New: Pollution Public Relations

Esso Standard Oil Co. isn't just doing something about air pollution control, it's talking about it too. Last week Esso brought health officers to its Bayway (N.J.) refinery to show progress being made in reducing air contaminants in refinery wastes.

Refiners have been spending a lot of money in recent years on air-pollution control (Esso-Bayway estimates that it has spent several million dollars on pollution control since 1952). Nevertheless, some health officials and industry critics periodically attack petroleum processing plants as being principally responsible for air pollution (PW—May18'56,p50).

Esso figured that a little education might go a long way toward reducing such complaints.

Many of the health officials were told for the first time what refinery wastes are and how much of such wastes enter the Bayway atmosphere.

Esso told the visitors that a little more than half of the pollutants that escape from the refinery are the result of combustion operations. Such operations release blue haze (oxidized sulfur); sulfur dioxide, an invisible gas; and unburned hydrocarbons in smoke.

Evaporation, Esso pointed out, also releases pollutants such as hydrocarbons, sulfur compounds, and mercaptans. About 32% of escaping pollutants at Bayway are the result of evaporation.

Catalyst dust from the refinery's fluid cat cracker is the third source of pollution. The Bayway cracking unit recovers over 99% of the finely ground catalyst. But a small percentage of the silica-based, inert powder does escape.

Esso made no attempt to show how refinery wastes as a whole contribute to air pollution, a most difficult question to answer.

First of all, information on the nature of air pollution is insufficient. And the many atmospheric variables, such as wind velocity and precipitation —along with inadequate measuring equipment—make it virtually impossible to fix the blame for pollution on any one or several sources.

The company showed the visitors the equipment and methods it has used to cut pollutant-escape by 65% since 1952.

Sulfur extraction, Esso says, has done the most to cut down pollutant escape. Bayway now has two hydrofining units, with a third on the way. Esso says it is also buying lower-sulfur-content crudes than previously.

Hydrocarbon emissions from combustion have also been seriously reduced, an Esso spokesman said. "We've eliminated the boiler houses, which formerly supplied our power, in favor of electricity. This, along with less flaring due to better process instrumentation, has resulted in far less hydrocarbon escape into the atmosphere. And we're working for further reduction in flaring by making the possibility of unit upsets even more remote than at present."

Bayway engineers are attacking the evaporation problem by revamping storage facilities. Light-product loss is expected to be reduced by an underground storage cavern being built for LP-Gas. And the last of 35 floating-roof tanks to cut evaporation in stored crude and gasoline will be done soon.

The number of leaks and spills in the plant's pipeline system is being substantially reduced by a new replacement program. Esso said that it is also moving even closer to perfect on recovery of catalyst dust in the cat cracker. The company's approach: development of "stronger" fluidized-solid catalysts, which would better resist reduction in particle size. (The slower the catalyst-size reduction, the smaller the amount of catalyst which can escape in a given amount of time.)

After give-and-take discussion, the health officials came away feeling that Esso-Bayway is doing all it can to control pollution.

One of the visiting health officers told PETROLEUM WEEK: "Now this is the kind of information we need. It's certainly a good idea to sit down together and talk these things over. Before today I had no idea of the precautions being taken here."

Most of the other visitors were equally impressed.

From Outer Space

Not really. But this secondary fractionating tower being installed at Sinclair Refining Co.'s Corpus Christi refinery looks as though it might have come from another planet. The futuristic appearance is due mainly to the 26 manway "blisters" lining the tower for maintenance access.

Exotic Fuels' Growth Raises No Eyebrows

"It probably means little skin off our back." That's a representative oil company's reaction to last week's announcement by Olin Mathieson Co. that high-energy "synthetic" fuels "will be a billion dollar business by 1967."

Olin Mathieson is one of several manufacturers of high-energy fuels—chemical compounds with Btu content considerably higher than that of petroleum-based fuels. Like other companies involved in such manufacturing, Olin Mathieson is multiplying its capacity for making high-energy compounds. Last week it offered the prediction on how far and how fast these "exotic" fuels will find a market.

Fuel experts believe that, because of cost, these synthetic fuels will be used on a wide scale only as a specialized aviation fuel—mostly for rockets (PW—Apr.12'57,p65).

Last week PETROLEUM WEEK asked a major oil company, a leading supplier of aviation fuel, how the new fuels will affect its sales to the aviation market. It's conclusion: Despite manufacturers' efforts to lower the cost of these high-energy fuels, the "exotics" will prove economically attractive only for special applications in military aviation. As a result, the company feels demand for petroleum-based jet fuel will suffer little.

Actually, the synthetics could become an important aid for petroleum processors—as gasoline additives.

One of the high-energy compounds —boron—is already being widely used as a base for a motor fuel additive (PW—Apr.12'57,p70).

And a synthetic fuels expert told PETROLEUM WEEK this week that another of the exotics "is now showing even more promise than boron as a possible gasoline additive."

What's New
IN REFINING

Standard Oil Co. (Ind.) will greatly increase its research on nonhydrocarbon rocket propellants.

Standard has been carrying on research on solid propellants as possible rocket starters for the Air Force since 1951.

Now the company is building additional lab facilities for the work at its Seymour (Ind.) research center. The facilities will be completed by fall. Olin Mathieson Chemical Corp. has also announced plans to increase similar research.

•

The Lummus Co. has sold its heat exchanger division, which makes heat exchangers for chemical and petroleum processing. The division was bought by Yuba Consolidated Gold Fields, of San Francisco, for $2-million.

Lummus reportedly sold the division so that it could concentrate more on its engineering and construction services for the processing industries.

•

Shell Development Co. is making generally available a process it has developed for longer life in refinery equipment. Shell has just put its air-injection process for prevention of hydrogen blistering of steel equipment on a royalty-free basis.

•

A new electronic computer is said to offer fully-automatic control for processing.

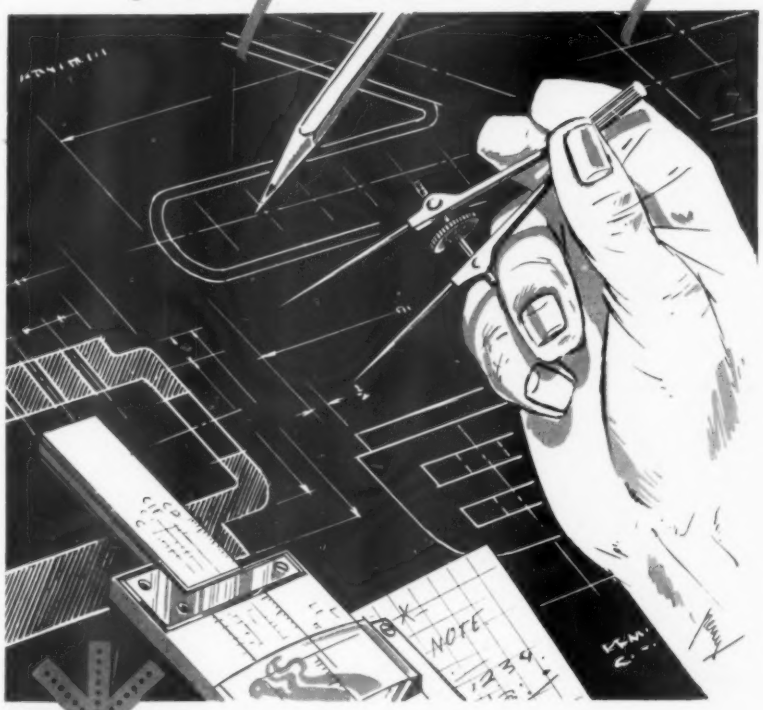
Ramo-Woolridge Corp., maker of the RW-300, says that the computer —when used as a central unit in a process control system—will automatically read process instruments. It also will perform the necessary computations in relating these readings to process objectives; determine the control actions that will result in best plant operation; and activate process mechanisms or adjust set points on supervised control loops.

•

Atlantic Refining Co.'s 62,000 b/d refinery at Port Arthur, shut down for almost two weeks, is expected to come back on stream next week.

The plant was shut down for its semiannual cleanout a month early because of "mechanical difficulties." The appearance of water in high-gravity crude is said to have caused the early cleanout.

WE SELL BURNER *Engineering*



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DEPT/Marketing

Oil's 'Electronic Marketing' Arrives

- **Sales data from Esso's ten divisions is sent by leased telephone wires to . . .**
- **Data processing center, where electronic "brain" compiles information to give . . .**
- **Management rapid access to accurate, comprehensive data on which to base . . .**
- **Faster and better decisions, thus keeping abreast of rapidly expanding markets.**

For the first time, electronics is moving into oil marketing in a big way. Last week Esso Standard Oil Co. announced plans to build a computer-equipped center as the hub of a marketwide communications wheel.

For years, major oil companies—along with most other industries—have been preparing for this new era of speed and efficiency brought into being by huge electronic "brains." These machines supply management with computed mass information—helping them to make decisions that, at one time, seemed hopelessly complex (PW—Mar.9'56,p24).

The IBM 705 that Esso will use at its center is one of seven that have been installed for oil companies by International Business Machines Corp. More are on order. Esso is already using these mammoth 705 computers at its Baton Rouge and Bayway refineries (PW—Jun.7'57,p55).

Standard Oil Co. (Ohio) has had a 705 in operation at its Cleveland (Ohio) headquarters for over a year (PW—Mar.9'56,p24). The machine serves as a "filing and fact-finding" arm for the marketing department, as well as for the technical and operations departments.

Esso's new data processing center—at Towson, Md.—will receive marketing data by leased telephone wires from the company's ten sales divisions. An IBM 705 computer will compile the information and return the results to the sales divisions.

The site of Esso's computing center is adjacent to the company's new Delaware-Maryland-District of Columbia division headquarters, now under construction just north of Baltimore. The center will be housed in a separate building. The program is expected to be in operation within two years.

Esso's marketing territory covers 18 states, from Maine to Louisiana. Cities to which the compiled market data will be channeled are: Boston; Pelham, N.Y.; Bala-Cynwyd, Pa. (suburb of Philadelphia); Elizabeth, N.J.; Baltimore; Richmond, Va.; Charlotte, N.C.; Columbia, S.C.; Memphis; and New Orleans.

The division headquarters are already equipped with smaller IBM computers. These machines will feed punch-card information to the leased telephone wires, which will carry the data to the center. Punched tapes may be used also, a company spokesman says.

Exact cost of the computing center has not been revealed. But an Esso spokesman says that the new division headquarters and the center, combined, are a "substantial part" of a $10-million development project in the area.

The center of activity for this giant communications system will be the the 705 computer, whose "memory" unit recalls facts and figures in a few millionths of a second.

Facts and figures flash into the 705 at the rate of nearly a million letters or digits per minute. The machine's memory unit has 20,000 storage positions.

Other information from the machine is stored on reels of magnetic tape, which hold up to 5-million characters each. Summaries, reports, and solutions to problems are typed out on electronic printers at rates of 150 lines per minute or more.

Material can also be transferred from one magnetic tape to another at record speed. For example: The complete text of "Gone with the Wind" can be transferred from one tape to another in 3½ minutes.

In initial stages, data processed by the center will include records of sales invoices, payrolls, stock accounting, and sales reports. By giving compilations of these data to management more speedily, Esso hopes to improve over-all accounting, reporting, and customer service.

Many applications of the 705 are possible. Esso indicates that its studies will be continued, to determine if other accounting and credit procedures should be adapted to the new equipment.

The computing center will furnish material to management that is not available now. And sales and cost reports will be available sooner, thus increasing their value.

Esso expects to realize economies in its accounting and reporting services, once the new program gets under way.

"Through gains in speed and accuracy," the Esso announcement says, "the new center will improve customer accounting service greatly, and will permit us to keep pace with the inevitable expansion in the marketing of oil products. The steadily increasing demand for energy, and the comparable rise in the volume of statistical work, make the use of the most modern methods not a luxury, but a necessity."

Esso plans to train its management to make the maximum use of electronic aids to marketing.

Esso has long had an orientation program on data-processing operations for its New York management, and for its division office managers. Now this program will be extended to other supervisory personnel at the divisional level.

It includes films, personal presentations, and meetings.

"We have to have men who know what a computing system can do for them, and how to use it . . . or the program becomes valueless," says an Esso spokesman.

Getting manpower to operate the electronic communications system is somewhat of a problem, too. By this September, Esso plans to begin training a staff of 22 while the center is being constructed.

"At some time, oil companies may be able to set up a data processing system on decentralized, marketwide basis," says an Esso spokesman, "but right now it would be impractical, because of the manpower problems. There wouldn't be enough personnel trained to man such a setup."

GENE WILLIAMS is first president, as . . .

Private Branders Form New Association

A new organization representing "all large independent-brand gasoline marketers" is setting up the machinery to make the private branders' voice heard.

The name of the organization is the Independent Brand Gasoline Marketers of America. Next on the agenda: finding someone to fill the position of executive secretary.

Officers of the group are: Gene Williams, Gasteria, Inc., president; Harold Johnson, Clark Oil, vice-president; and Ron Peterson, J. D. Street & Co., secretary-treasurer. Directors are: Bob Hudson, Phil Siteman, Jack Herbert, Jerome Glassman, Tom Murphy, Calvin Houghland, and Harold Martin.

So far, 18 companies, representing 3,000 service stations, have joined together to crystallize their position within the industry and to "promote the mutual protection and benefits of independent branders."

The membership represents all U.S. markets east of the Rocky Mountains, with the exception of New England, according to Williams. Williams estimated that there are about 50 large independent brand chain operators, a group which is rapidly growing (PW —Jun.14'57,p72). There are possibly several hundred smaller operators of this type.

The group expects its membership to consist primarily of large chain operators, but there is no decision to restrict membership to big companies, says Williams. He added that they

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Another Hewitt-Robins "first", the new Twin LPG Hose combines a sturdy liquid hose and a safe vapor return hose in one firmly bonded, easy-to-handle unit. It eliminates two-reel operations and tangled lines; minimizes pressure-differential wear and tear on meter and pump. This hose is now available in 1" x ¾" and ¾" x ½" sizes.

Hewitt-Robins Twin LPG Hose pays out and rewinds smoothly and quickly . . . saves the driver's time and enables him to serve more customers with less effort. This ruggedly constructed, permeation-resistant hose is light in weight . . . fits any tray or reel on any truck. To find out how H-R products and services can help you, consult your classified telephone directory for the nearest H-R representative, or contact Hewitt-Robins, Stamford, Conn.

HR HEWITT-ROBINS

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INDUSTRIAL HOSE . . . VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

expect to get 20 or 30 additional members. Each application for membership will be passed on separately by the board.

A yearly budget of $90,000 to $100,000 is planned for the organization. This money will be used primarily to retain an executive secretary and to lobby in Washington.

The board set the dues structure by determining the necessary budget, and anticipating the number of members the group would have. Then each company's dues were set by the board according to its ability to pay.

The group's main aim will be to improve market relations with each other and with major companies.

Company presidents will meet to formulate group policies. In the past, independent branders have spoken up only as individual companies.

Members of the group will continue to participate in other industry groups, says Williams, but "we want to think as a group, so that we will have a more effective voice."

"In this competitive business," he adds, "motives are often badly misconstrued . . . We'd like to act as a sounding board, so that our position in the market will be better understood."

What's New / IN MARKETING

Gulf Oil Corp. is planning its first move into the Minnesota market. Plans were disclosed last week when the Minneapolis planning commission refused to recommend the company's request for a station building permit.

Gulf's request for permission to build its first Minnesota station was opposed by a group of residents from the neighborhood for which the station was planned. They said that they objected because the project would require further commercial rezoning of the neighborhood.

The commission told a company representative that its action was "not intended to discourage Gulf from entering Minnesota. We hope you will be able to find a more suitable location."

•

Bay Petroleum Corp.—a subsidiary of Tennessee Gas Transmission Co.—has acquired 75 new service stations through the purchase of Citizens Oil Co., of Forsyth, Ga. The move is part of the company's drive to get more retail outlets for its refined products.

The chain of newly acquired stations runs through Georgia, Florida, and Alabama. With the outlets, Bay also acquired four terminals with a capacity for 225,000 bbl. of gasoline and 110,000 bbl. of lube oil; 15 truck transports; eight barges (two of them leased); and five tugboats.

•

North Carolina gasoline marketers are wondering how low prices can sink. "On-again, off-again" retail price wars have pushed dealer tankwagon prices down to a "net" 5.9¢ per gal. (ex tax) for regular in Charlotte, N. C. "How far down is bottom?" dealers are asking.

Current weak prices have depressed markets throughout most of the state. Some suppliers reportedly are offering voluntary allowances as high as 10¢ a gal. off tankwagon postings to meet competitive price-war cuts.

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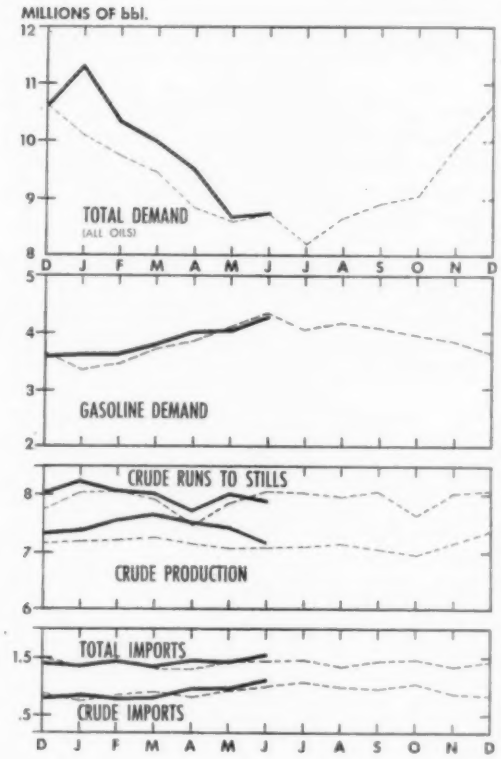
PETROLEUM WEEK'S

Fingertip Figures



TOTAL DEMAND
Latest week average 8.769
Year ago 8.506

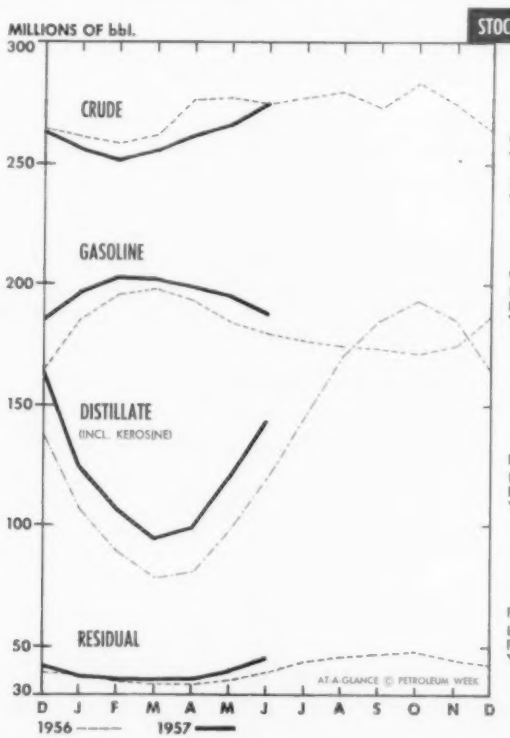
GASOLINE DEMAND
Latest 4-week average 4.312
Year ago 4.130

RUNS TO STILLS
Latest week 7.972
Previous week 7.840
Year ago 8.028

CRUDE PRODUCTION
Latest week 6.882
Previous week 6.952
Year ago 7.084

TOTAL IMPORTS
Latest week 1.642
Previous week 1.641
Year ago 1.497

CRUDE IMPORTS
Latest week 1.287
Previous week 1.269
Year ago 1.191



CRUDE STOCKS
Week-ended 7-6 279.0
Previous week 277.3
Year ago 273.3

GASOLINE
Latest week 182.0
Previous week 185.9
Year ago 178.4

DISTILLATES
Latest week 154.8
Previous week 148.2
Year ago 131.9

RESIDUAL
Latest week 47.0
Previous week 46.2
Year ago 40.9

Regardless of lower domestic producing rates, there appears to be little chance that the present rate of inventory accumulation will be reduced any before fall.

Crude and products have been added to inventory at a rate of close to 1-million b/d during the last two months. Such a gain is about 400,000 b/d higher than the stock accumulation during the like part of 1956.

While a rise in total stocks is normal during the seasonally low-demand summer months, the current rate of accumulation indicates that stocks will be excessive before the fall upturn in demand.

One reason for the continued high accumulation is that total imports are scheduled to average about 1.6-million b/d at least through the third quarter.

There may be some reductions by the fourth quarter (page 8). But possible reductions then would be too late to prevent a dangerously high level of stocks.

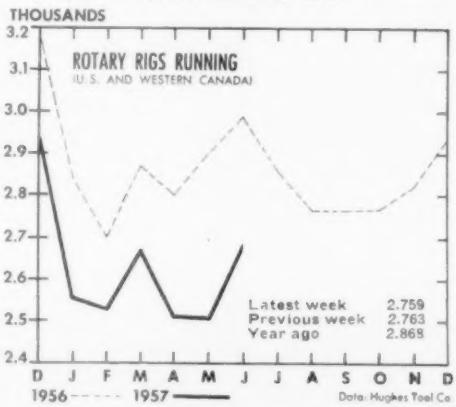
Too, domestic producers will certainly resist any further cutbacks in U.S. crude output, particularly in the face of the high level of imports.

The Bureau of Mines this week estimated that demand for domestic crude in August will average 6.7-million b/d, 275,000 b/d below its forecast for July.

Current crude output is just under 7-million b/d, and new production will push it higher by August. Even so, producers feel they are now cut to a rock-bottom level. The 13-day schedule in Texas is the "crowning blow" to many independent producers.

And finally, demand so far this year just isn't holding up to expectations. It could move higher, of course, but just now there are more pessimists than optimists.

The gain in total demand in the first half was 5.8% over 1956. But for domestic demand—the really important factor—the gain was just a little over 1%.



Latest week 2.759
Previous week 2.763
Year ago 2.868

The Market Trend

AT-A-GLANCE
Copyright
PETROLEUM WEEK

For Fuel Oils: It's a Long Way to Fall

Fuel oils are looking softer and softer, but the buyers couldn't care less. Sales managers increasingly are facing up to the question: Can we hold the account if we hold the price? This week, the answer generally was No.

The recent slip in distillate prices didn't seem to move any product at the Gulf. Kerosine and No. 2 fuel were offered freely at 9.25¢ in cargo lots, down 0.375¢ and 0.25¢ respectively. Sellers sweetened up their offerings, promising two cargoes next winter if anybody would just take one off their hands now. Traders predicted that further declines were in order.

Last week's drop of 10¢ in heavy fuel, to $2.65 for cargo lots, seemed hardly conclusive. Export sales from the Gulf were out of the question unless sellers met the $2.55 Caribbean price. Surplus resid was flowing down to the Gulf from the Mid-Continent. East Coast buyers, fearing a general cut in the offing, were standing pat.

Fancy discount prices were rumored in Chicago, particularly on residuals. Road oil sales have lagged this season, with the result that No. 6 stocks are bulging. One seller was thinking of loading up some barges to move surplus material down the river toward the Gulf. No. 2 fuel prices in Chicago are soft: They are 0.25¢ lower, at 9.75¢, than they were a year ago—when crude was 25¢ a bbl. cheaper.

About the only live inquiry in the market was one for a cargo of stove oil for shipment to Canada. To state it mildly, the request provoked more than passing interest among refiners.

For Products—Lower Visibility:

An almost unnoticed trend is that refinery markets are getting more and more hedged in. This week, U.S. and Caribbean sellers were nonplussed to learn that a Canadian customer of other years was able to fill a 500,000-bbl. gasoline requirement right in Montreal.

Caribbean refiners also found Italian competitors fighting to push them out of markets in nearby West Africa. Italian refiners had to give up these nearby outlets during the Suez crisis. Now they want them back.

But Long Lines For Crude:

But if product sales seem more compartmentalized, crude markets—particularly for Middle East oils—seem to have no bounds. One reason: Many of the tankers coming off the ways now were contracted for several years ago to deliver at about USMC—50% rates.

Thus, Valparaiso, which is about as far away from oil as you can get, can be reached from the Middle East for not much more than $1.00 a bbl. Many of these low-price charters will run at cheap rates for the next eight years.

East vs. West:

The wedge that may hammer home a further break between Eastern and Western Hemisphere prices may be kerosine. The product is losing its identity in the U.S., and today is barely able to command a premium over No. 2 fuel.

On the other hand, Persian Gulf sellers feel that the current 0.5¢ differential for kerosine over No. 2 is hardly enough. Some say it should be 1¢.

The Market Place AROUND THE WORLD

Prices compiled for PETROLEUM WEEK by Platt's OILGRAM Price Service and National Petroleum News, McGraw-Hill Publications

All Prices as of July 15

Bold face type indicates changes from previous week

KEY PRICES—REFINED PRODUCTS

(¢ per gal. except dollars per bbl. where $ is shown)

Western Hemisphere

U.S. Gulf Coast, cargoes
- Gasoline, 98 oct prem....13.5-14.375
- Gasoline, 92 oct reg....11.5-12.625
- **Kerosine....9.25↓-11**
- **Heating oil, No. 2....9.25↓-10.5**
- **Gas oil, 48-52 d.i....9.5↓-10.625**
- **Fuel oil, bunker "C"....$2.65↓-3.15**

Caribbean, cargoes
- Avgas, Grade 100/130....17.5
- Gasoline, 93 oct research prem....11.75
- Gasoline, 87 oct research reg....10.875
- Gasoline, 79 oct research....10.125
- Gasoline, 70-72 oct motor method....9.75
- **Kerosine....9.25↓-9.625**
- **Heating oil, No. 2....9.25↓-9.5**
- **Gas oil, 48-52 d.i....9.5↓-9.75**
- Fuel oil, bunker "C"....$2.55

New York Harbor, barges
- **Kerosine....11.15↓-11.65↓**
- **Heating oil, No. 2....10.65↓-11.15↓**
- Fuel oil, No. 6....$3.10-3.15

Okla-Group 3, northern, shpt, bulk
- Gasoline, 89 oct reg....11.75-12.25
- Kerosine....10.125-10.875
- Heating oil, No. 2....9.125-10.25
- Fuel oil, No. 6....$2.15-2.45

Chicago, bulk
- Gasoline, 91 oct reg....13-13.8
- **Heating oil, No. 2....9.75↓-10.65**
- Fuel oil, No. 6 high sulfur....8.35-8.7

Los Angeles, rack
- Gasoline, 84 oct reg....13.6
- Diesel fuel, PS 200....10-11.25
- Light fuel, PS 300....$3.40-3.65
- Heavy fuel, PS 400....$2.85-3.05

Natural Gasoline, Grade 26-70
- FOB Group 3....4
- FOB Breckenridge, Tex....3.5

LP-Gas
- Propane, Oklahoma (Group 3)....3.5-5

Penna Lubes
- Bright stock, 25 p.t....27
- 200 vis. neutral, 25 p.t....25

Mid-Continent Lubes, Tulsa basis
- Bright stock, solvent, 95 v.i....25.5-26.5
- Neutral, solvent, 200-210 vis....21.25-22.25

Gulf Coast Lubes
- Bright stock, solvent, 95 v.i....26.5
- Neutral, solvent, 200 vis....23

Eastern Hemisphere

Singapore (Pulau Bukom), cargoes
- **Avgas, grade 100/130....18.625↓**
- **Gasoline, 79 oct research....10.5↓**
- **Kerosine....10.75↓**
- **Gas oil, 48 d.i. minimum....10.625↓**

KEY PRICES—CRUDE OIL

(2¢ differential per deg. of grav. applies except as noted)

Western Hemisphere

United States (at the well)
- Mid-Continent, 36.0-36.9....3.07
- North Dakota, 36.0-36.9....3.07
- Texas:
  - Gulf Coast, low cold test, 26.0-26.9....3.50
  - G. Coast, upper & Lower, 26.0-26.9....3.07-3.22
  - West Texas, sweet, 36.0-36.9....3.07
  - West Texas, N. M. inter., 36.0-36.9....3.00
  - West Texas, N. M., sour, 32.0-32.9....2.86
  - East Texas, flat....3.25
  - Mirando, 28.0-28.9....3.51
- Illinois Basin, flat....3.15
- Pennsylvania Grade, Bradford dist. flat....4.88
- California, Signal Hill, 21.0-21.9....2.93†
- North Louisiana-Arkansas, 36.0-36.9....3.20
- Wyoming sweet, 36.0-36.9....3.00
- Wyoming sour, 32.0-32.9....2.71

Canada (flat prices, at the well)
- Acheson-Stony Plain (Alta.)....2.72
- Leduc-Woodbend (Alta.)....2.78
- Redwater (Alta.)....2.67
- Daly (Man.)....2.52
- Smiley (Sask.)....2.44

Venezuela (Cargoes, FOB lifting port designated)
- Cumarebo, 48.0-48.9, Tucupido....3.75
- San Joaquin, 41.0-41.9, Puerto la Cruz....3.34
- Oficina, 35.0-35.9, Puerto la Cruz....3.05
- Tia Juana, Medium, 26.0-26.9, Amuay....2.55
- Bachaquero, flat, Amuay, Las Piedras....2.23
- Tarra, 38.0-38.9, San Lorenzo....3.08
- Lagunillas Heavy, flat, Amuay....3.28
- Cardon....2.20

†*Differential per deg. of grav. varies.*

Eastern Hemisphere

Middle East, Persian Gulf (Cargoes, FOB lifting port)
- Arabia, 34.0-34.9, Ras Tanura....2.08
- Safaniya, 27.0-27.9, Ras Tanura....1.79
- Iran, 34.0-34.9, Bandar Mashur....2.04
- Iran, 34.0-34.9, Abadan....1.99
- Iraq, 35.0-35.9, Fao....1.98
- Kuwait, 31.0-31.9, Mina-al-Ahmadi....1.85
- **Qatar, 41.0-41.9, Umm Said....2.23†**

Middle East, Eastern Mediterranean
- Arabian, 36.0-36.9, Sidon....2.69
- Iraq, 36.0-36.9, Tripoli, Banias....2.69

Far East, Cargoes, FOB Lutong, Sarawak
- Seria Light, 37-38....2.75

KEY TANKER RATES

(Last paid, per long ton, single voyage)

U.S. Gulf-N.Y., clean	(USMC —15%)	$2.42
U.S. Gulf-N. Y., dirty	(USMC —27½%)	$2.97
NWI-USNH, dirty	(USMC —45%)	$1.49
NWI-UK/Cont., dirty	(Scale —10%)	29/3*
Pers. Gulf-UK/Cont., dirty	**(Scale —25%)**	**42/2***
Persian Gulf-USNH, dirty	(USMC —50%)	$6.35

**Sterling*

DEPT/Personals

JOHN H. DEA has been appointed assistant to the president of The Texas Co., New York. He has been assistant manager of the sales division of the company's foreign operations department — Western Hemisphere and West Africa, since November, 1956. A Texaco subsidiary, The Texas Pipe Line Co., Houston, has appointed **C. E. Landon** assistant to the management. He is succeeded as treasurer and head financial officer by **W. R. Griffin, Jr. L. J. Shelton** replaces Griffin as comptroller of the pipeline subsidiary. Shelton was formerly secretary and treasurer.

J. H. Dea

Maj. Gen. Gilchrist

MAJ. GEN. JOHN R. GILCHRIST has joined Tidewater Oil Co. in the newly created post of administrative vice-president for organization planning and development, in San Francisco. Until his retirement from the Air Force in June, 1957, he was both commander of the Air Force Finance Center in Denver and assistant comptroller of the Air Force.

M. J. HUFFMAN will manage the crude oil purchasing office in Calgary for Imperial Oil Ltd. He succeeds **J. Warren Flanagan,** who has been made assistant manager of the coordination and economics department. Huffman previously served as assistant manager of the crude oil purchasing section.

F. K. RADER has been elected vice-president, and **H. L. STOWERS** vice-president and chief engineer, of Texas Gas Transmission Corp., Owensboro, Ky. Rader was formerly assistant to the executive vice-president; Stowers was chief engineer. **C. E. Coffey,** manager of the Jeffersontown (Ky.) compressor station, has been promoted to superintendent of the company's Kentucky and Indiana division. He will be headquartered in the compressor department of the Owensboro general office.

H. S. DICKSON is the newly appointed administrative vice-president of Empire Petroleum Co., refinery operator at Denver, Colo., and Sheboygan, Wis. **Harold K. Johnston,** who has been in charge of asphalt sales for Ohio Oil Co., becomes Empire's sales manager. Dickson, with the company for the past three years, was formerly assistant vice-president of Frontier Refining Co.

ROLAND C. SMITH and **JOSEPH C. ROBERTS** have joined Wm. Ross Cabeen & Associates, in Dallas, Tex., and Lima, Peru, respectively. Smith, a geologist, was formerly assistant to the regional exploration manager, in Dallas, for Atlantic Refining Co. Roberts was formerly district geologist with Shell Oil Co. in Corpus Christi. Cabeen & Associates is a geological and engineering consultant firm.

WALTER D. EDWARDS, JR., has been transferred to the Shreveport (La.) office of Murphy Corp. as geologist. He will be replaced at Billings, Mont., by **James B. Powell, Jr.,** formerly associated with Jones & O'Brien, Inc., in Louisiana.

CHARLES PERRY, Magnolia Petroleum Co., is the new president of the Midland (Tex.) Oil Scouts' Assn. Other new officers include **Dick Whitson,** Sunray Mid-Continent Oil Co., first vice-president; **Jack Nunley,** Sun Oil Co., second vice-president; and **Jimmy Gotcher,** Gulf Oil Corp., secretary-treasurer. Nunley and Whitson will serve as "bull scouts" for the south and north areas, respectively.

W. FRANK WALTHALL will be in charge of the new operations office in Calgary for U. S. Smelting, Refining & Mining Co. He is transferring from the Billings (Mont.) office, which the company is closing. Other Billings staff members relocating are **F. R. Smith,** to Calgary; **Marion F. Wall,** landman, and **John Sheridan,** geologist, to the firm's Denver office.

NORMAN A. SAX, assistant division production geologist in Midland for Humble Oil & Refining Co., is transferring to Alaska as production geologist in charge of drilling a 12,000-ft. wildcat. **Bruno Hanson** and **Sam Bishop,** subsurface geologists in the Midland office, are also in Alaska, doing subsurface work for the project.

LEONARD YOUNG has joined the geological staff of Lowell J. Williamson in Denver. Until recently, he was associated with Petroleum, Inc., in Denver. He has been active in the Rockies for several years.

MARVIN A. BOMER and **DUNCAN NEBLETT** have been elected senior vice-presidents of Eastern States Petroleum Co. Both men will continue to serve in their present positions as vice-presidents, Bomer in charge of refining and manufacturing, and Neblett as general counsel.

CAPT. ERNEST TYRRELL has been appointed commodore of the 38-vessel tanker fleet of Esso Petroleum Co., Ltd., London. Since last year, he had been master of the "Esso Columbia," a 36,000-ton supertanker.

TIDEWATER OIL CO. has reorganized the eastern divisional staff of its New York marketing department. Two newly created positions have been assigned to **Robert M. Metcalfe,** retail and distributor sales manager; and **Rush F. Carrier,** dealer and distributor relations manager. Metcalfe formerly was retail sales manager; Carrier was distributor sales manager. Other new Tidewater appointments in New York are **William M. Grass,** marketing assistant to the divisional marketing manager; **Edward R. Kendrigan,** operations manager; **Samuel H. Crymble,** distributor sales supervisor; **Eric O. Dahl,** fuel oil and specialty products sales supervisor; and **Wilbert B. Dubin,** automotive lubricants sales supervisor. Changes in the New York field district include **Arthur W. Barrell,** sales manager; **Joseph A. Carelli,** sales assistant; **Joseph M. Jerome,** assistant to the marketing manager; and **J. Carl Murphy,** service station planning supervisor. **Donald Y. McCoy** is the New England district sales manager.

JOHN D. RAUNBORG will manage the newly created internal auditing department of Kerr-McGee Oil Industries, Inc., Oklahoma City. **Richard D. Robins,** formerly manager of the company's tax and auditing department, before its division into two separate departments, will continue in the capacity of manager of the tax department. Raunborg was formerly senior accountant for Arthur Anderson & Co., Houston.

FULTON W. COPP is the new vice-president of sales for Pacific Northwest Pipeline Corp., Salt Lake City. He was formerly manager of rates and sales. **William G. Cutler** succeeds **L. G. Truby, Jr.,** as manager of production operations and reservoir engineering at Pacific Northwest. Truby was recently made general manager of production. **T. A. Dugan** is appointed division manager of the company's San Juan Basin operations, at Farmington, N. M. Dugan previously associated with Phillips Petroleum Co., replaces **Oliver W. Fowler.**

F. W. Copp

A. R. LaForce

ARNOLD R. LaFORCE, New York, financial vice-president of El Paso Natural Gas Co., has been elected a director of Tekoil Corp. **C. L. Perkins,** of El Paso, Tex., El Paso vice-president, has been made a member of Tekoil's executive committee. He earlier was named a director of the company when El Paso acquired an interest in Tekoil.

DON WOODARD, landman for Texas Pacific Coal & Oil Co., Ft. Worth, has been appointed secretary of the American Assn. of Petroleum Landmen.

HAL P. SHAWLEE has been named field director for the Oil Information

Committee in Arizona, California, Nevada, Oregon, and Washington, succeeding **Warren Hillgren.** Shawlee has been an OIC public relations representative for the past 22 months.

WARREN POND becomes Houston district landman for Trunkline Gas Co. Before joining the company, he worked for Gulf Oil Corp. in Houston and Midland for five years.

R. O. RHOADES is a new director and member of the executive committee of Gulf Oil Corp., Pittsburgh. He will continue to serve as senior vice-president and chairman of the company's administrative committee.

JACK H. ABERNATHY, president of the American Assn. of Oilwell Drilling Contractors, has been elected director-at-large of the U. S. Chamber of Commerce. He will serve on the Natural Resources Committee. Abernathy is also vice-president of Big Chief Drilling Co., Oklahoma City.

J. HOWARD CORRY is the new assistant manager of heavy fuel oil sales for American Oil Co., New York. **William D. Fraher, Jr.,** will succeed him as southern district manager of Amoco's heavy fuel oil department, in Jacksonville, Fla.

C. M. BAILEY has been named to the newly created post of district superintendent for Shell Oil Co. at Billings, Mont. **Gil Flanagan** is the new North and South Dakota district scout, in Glendive, Mont., replacing **Don Davis,** who has transferred to Lamar, Colo. **W. C. Howard,** tool pusher in Glendive, has moved to Casper, Wyo.

WOODROW WILSON is the new district geologist in the Bismarck (N. D.) office of Ohio Oil Co. He succeeds **Derral F. Mecham,** who has transferred to Salt Lake City in a similar position.

ALVA C. DAVIS EXPLORATION CO. has been newly organized in Fairfield, Ill., by **Alva Davis, Howard Simcox,** and **Jack Freud.**

HOWARD STOSKOPF has resigned as vice-president of Coppinger Drilling, Inc., to become an independent operator in Wichita, Kan.

WILLIAM C. BARNES, a recent graduate has joined Honolulu Oil Corp., at Taft, Calif., as a petroleum engineer.

J. C. BAUGUSS, JR., has been appointed valuation engineer for Southern Pacific Pipe Lines, Inc., in Los Angeles headquarters.

JOHN D. HAUN, C. R. HAMMOND and **JAMES A. BARLOW, JR.,** have formed the geological consulting firm of Barlow, Hammond & Haun. Haun, associate professor at the Colorado School of Mines, will maintain offices in Denver; Hammond, formerly with Hartco, Inc., will operate from Billings, Mont.; and Barlow, formerly with Forest Oil Co., will be based in Casper, Wyo. The company will specialize in the Rocky Mountain region.

CHARLES G. KEPLER has been appointed general attorney of Husky Oil Co.'s legal department, Cody, Wyo. This position was formerly held by **J. R. Learned,** who is now manager of land and exploration for the company. Kepler also has been named company secretary, succeeding **Maurice E. Smith,** now vice-president of finance. Kepler has been an attorney with Husky since June, 1952.

C. G. Kepler

J. N. Carney

JAMES N. CARNEY is the newly appointed general manager of sales for American Oil Co., New York. He has been regional sales manager in Baltimore since 1954.

HARRY A. BALDWIN, vice-president of Arrow Petroleum Co., has been elected president of the Chicago Gasoline Jobbers Assn., succeeding **P. R. Crippen, Jr.** Other new officers are **Robert G. Atkinson,** Clark Oil & Refining Corp., vice-president; and **Karl D. Friend,** K. Friend & Co., secretary. Three newly elected directors are **Harry W. Bohnett,** Bohnett Oil Co.; **Henry O. Stroemer,** George C. Peterson Co.; and **Edward R. Smith,** Oklahoma Oil Co.

DON CAMPBELL, director of public relations for Standard Oil Co. (Ind.), has been elected a director of the Chicago chapter of the Public Relations Society of America.

F. PIERCE COGGESHALL, JR., has been appointed New Orleans district manager of asphalt sales for Pan-Am Southern Division of American Oil Co. He will be in charge of sales in the states of Kentucky, Tennessee, Arkansas, Mississippi and Louisiana. Since 1952, he has been a sales engineer in the asphalt department in Harrisburg, Pa., serving Pennsylvania and New Jersey.

F. P. Coggeshall, Jr.

R. E. Graham

R. E. GRAHAM is appointed to the new position of assistant district superintendent of Pan American Petroleum Corp., at Lubbock, Tex. He has been aviation superintendent in Tulsa for the past 6½ years.

DR. L. T. EBY has been named senior market development engineer responsible for industry information for Enjay Co., New York petrochemicals marketing subsidiary of Standard Oil Co. (N. J.). He was formerly a research chemist with Enjay's research affiliate. **Frank C. LaMotta,** formerly with E. I. du Pont de Nemours & Co., also has joined the market development division. Five new sales representatives have been named in the mid-Atlantic district of Enjay's eastern division. They are **Glenn W. Boynton, Richard C. Gazley, Steven M. Lyons, James I. Kennedy,** and **Elmer F. Smith, Jr.**

GEORGE T. HANSEN, JR., Utah Southern Oil Co., is the new 1957-58 president and director of the Petroleum Club of Salt Lake City. Other officers are **Clyde L. Anderson,** Christensen Diamond Products, first vice-president; **Larkin O'Hern,** Sinclair Oil & Gas Co., second vice-president; **Melvin E. Leslie,** Skyline Oil Co., secretary; and **Darrell E. Smith,** Pan American Petroleum Corp., treasurer. Other new directors include **Ed D. Knight, Jr.,** Riley's Reproduction Co., and **N. G. Morgan, Jr.,** Oil Securities & Gas Corp.

R. E. McPHAIL has been named southeastern regional manager of the land and geological department of Phillips Petroleum Co., Bartlesville, Okla. He succeeds **J. E. Kendall,** who, as previously reported, resigned to become a vice-president of Blanco Oil Co. **R. I. Sewell,** regional landman, will assume additional duties as assistant regional manager, succeeding McPhail. **H. R. Segnar** becomes southeast regional geologist, at Bartlesville. He is succeeded as division exploration geologist at Oklahoma City by **E. F. Wroblewski. A. M. Vaughn,** formerly assistant division exploration geologist at Oklahoma City, replaces Wroblewski at Ardmore, Okla.

JOEL LLOYD has been appointed an aide to the general manager of Union Oil Co.'s over-all international exploration and drilling operations. He will handle the company's foreign exploration operations. Also newly appointed is **Newell Williams,** in charge of Union's negotiations with Latin American governments for oil exploration and exploitation agreements. Williams will continue to handle Guatemalan operations in addition to his new duties. **Stanley Martin** succeeds Lloyd as head of Union's drilling operations in Costa Rica. He was formerly on-the-site manager of drilling in southern Costa Rica. All three men will make their headquarters in San Jose, Costa Rica.

E. S. BRAINARD and **MARTIN SARAF** have been appointed geologists of Petroleum Exploration, Inc., Amarillo, Tex. Brainard also heads the mud logging division of the company. Saraf practiced law for eight years before completing his work in the field of geology.

WILLIAM F. SADLER has been appointed oil and gas representative and business development representative for the Toronto-Dominion Bank, at Calgary.

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FRED L. GOLDSBY, vice-president, has been appointed assistant to the president of Chicago Bridge & Iron Co., Chicago. He is succeeded as general sales manager by **S. C. HAMILTON,** who also has been named a vice-president. **K. W. Lange,** formerly with the San Francisco sales office, replaces Hamilton as Houston district sales manager.

JOHN R. STROBEL has joined Garlock Packing Co. as sales engineer in the Denver branch. He was previously associated with Black & Decker Mfg. Co. in a similar position. Garlock Packing manufactures packing gaskets, oil and mechanical seals, and rubber expansion joints.

JAMES H. McBRIEN has been named general sales manager of F. H. Maloney Co., Houston manufacturer of precision rubber, metal, and plastic products for the oil industry. He was formerly the Houston branch manager for Midwestern Pipeline Products Co.

RAY ST. ONGE and **GEORGE A. GREEN** have been appointed product manager and western district manager, respectively, of Beckman Instruments, Inc., Fullerton, Calif. St. Onge was formerly on the field engineering staff; Green was product manager for the company's infrared gas analyzers and gas chromatographs. The process instruments division manufactures industrial analyzers for on-stream analysis of petroleum, chemical, and related fields.

GEOPHYSICAL SERVICE INC. is occupying new quarters in Dallas' new Exchange Bank Building. The oil exploration firm is taking over 1½ stories of the 13-story bank building.

NICHOLAS A. VON NEUMAN is a new member of the patent and licensing division of Houdry Process Corp., Philadelphia. He formerly practiced general and patent law in Washington, D. C.

EDMUND W. DUGAN has been named to the newly created post of business manager for Girdler Co.'s catalyst department, Louisville, Ky. He formerly handled special assignments for that department. Girdler manufactures catalysts for the petroleum, chemical petrochemical, and fats and oils industries.

LUTHER M. LAMB and **SAMUEL A. WINDHAM** are new store managers in El Dorado, Ark., and Rodessa, La., respectively, for Jones & Laughlin Supply Division. Lamb formerly managed the Rodessa store, and Windham was storeman at that location.

JOHN W. OSTLER is the new president and director of Canadian Meter Co., Ltd., Milton (Ont.) subsidiary of American Meter Co. He was formerly vice-president and general manager. The company manufactures complete meters, replacement parts, and a variety of instruments for the gas and oil industries.

JERRY CAHILL is transferring to Ft. Worth as sales engineer for the electrical well services department of Halliburton Oil Well Cementing Co. He was formerly in Houston with the interpretation section of the company's research laboratory.

THE NOMADS, Los Angeles chapter, welcomes three new members to its organization.

Nomad officials and new members shown here are (l. to r.), **Bill Brooks,** Byron Jackson Tools, Inc., Nomad vice-president and ritual master; **Elvin K. Wilson,** Shaffer Tool Works, new regular member; **John P. Davis, Jr.,** Technical Oil Tool Corp., new regular member; **Peter S. Carberry,** Petroleum Week district manager, new associate member; and **Art Marshall,** H. C. Smith Oil Tool Co., Nomad induction committee member.

W. E. STRITTMATTER has been promoted to assistant treasurer of Mid-Continent Supply Co., Ft. Worth. Strittmatter, with the company since 1945, was formerly general office manager and chief accountant.

W. E. Strittmatter

H. L. Planche

HUGH L. PLANCHE has been appointed tubular manager of the Canadian division of National Supply Co., in Calgary. He succeeds **B. J. A. Sturrock**, who has resigned. Since 1955, he has been sales representative of the division office at Calgary. The company's export division has made four personnel changes. Newly appointed are **Charles T. Reichert**, manager of the London office, replacing **R. B. Rogers**, who has retired; **Howard C. Tait**, area manager for Venezuela, Mexico, and Alaska; **Galen L. Lindner**, export division engineer, succeeding Tait; and **James M. Davies**, district manager for Eastern Venezuela, at Anaco.

CONTINENTAL-EMSCO CO. has made several changes in its store managers and field operating personnel. Promotions and transfers of store managers include **Donald F. Woods**, to New Harmony, Ind.; **John W. Bohm**, to Salem, Ill.; **J. W. Ady**, to Drayton Valley, Canada; **Frank Ellis**, to New Iberia, La.; **Emery Lasster**, to Houma, La.; **Richard L. Cavnar**, to Shreveport, La.; **Robert H. Pace**, to Post, Tex. Newly appointed sales representatives are **Donald M. Butler**, Farmington, N. M.; **W. G. Forsyth**, Corpus Christi; **Freddie Vincent**, New Orleans; **Henry A. Lee**, Houston; and **Gary K. Ashmead**, Lafayette, La. Promoted to field salesman are **John E. Campbell** and **John R. Lendvoy**, Estevan, Canada; **Carmen R. Fairman**, Drayton Valley; **Ralph J. K. Oslund**, Edmonton; **M. S. Holleman**, New Iberia; **E. J. Duge**, Victoria, Tex.; **Elmo J. Fruge**, Eunice, La.; **Billie R. McKinney**, Jena, La.; **Jack N. Smith**, Refugio, Tex.; **William H. Beck** and **Jimmie W. Porter**, Liberal, Kan.; **J. B. McLeroy**, Hobbs, N. M.; **Albert N. Taylor**, Abiline, Tex.; **W. Lee Hiler**, Drumright, Okla.; **Earnest I. Ogilvie**, Perry, Okla. **Roland B. Bowden**, **George R. Nichols**, and **Charles W. Lee** have been named D+B specialists in Pampa, Tex., Hobbs, N. M., and Abiline, Tex., respectively. **Kenneth G. Underwood** and **Robert L. Whelchel** are new production machinery specialists in Lindsay, Okla., and Lafayette, La., respectively.

BENJAMIN D. RUSSUM will manage the newly expanded and reorganized midwest headquarters, in Chicago, of Blaw-Knox Co. Prior to the appointment, Russum was project manager for the company on the engineering, procurement, and construction of the first synthetic rubber plant in Great Britain. **George F. Kline**, formerly chief process engineer of the firm's Vulcan Engineering division, has been promoted to assistant manager of the chemical plants division's petroleum department, in Pittsburgh.

JOHN EILLS has been placed in charge of the new St. Louis (Mo.) sales office of Tracerlab, Inc. For the past several years, he has been in the headquarters sales office, working with all aspects of nuclear products development. **Thomas L. Kelley** becomes nuclear sales manager in the company's Waltham (Mass.) headquarters. He was formerly sales manager of the instrument division. The new St. Louis office will serve southern Illinois and Indiana, western Kentucky and Tennessee, Iowa, Missouri, Nebraska, and Kansas.

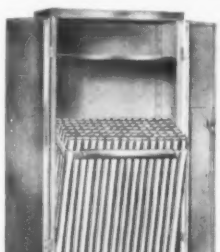
RAYMOND F. STEWARD has transferred from McCamey to Odessa, Tex., as field representative for Oil Well Supply Division, U. S. Steel Corp.

JOHN F. REED is the new general manager of the Consolidated Ashcroft Hancock division of Manning, Maxwell & Moore, Inc., Stratford, Conn. He was formerly works manager of the Muskegon (Mich.) plant. The company manufactures industrial products, including pressure gauges, valves, electronic instruments, cranes, hoists, and aircraft control components.

J. F. Reed

F. H. Lindall

FRED H. LINDALL is the new president of Petty Geophysical Engineering Co., San Antonio. He will also head the company's two subsidiaries, Petty Laboratories, Inc., and Petty Geophysical Co. For the past 18 years, Lindall has served as promotional and servicing engineer for Anderson-Prichard Oil Co.



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Oil Can Be Found—At a Price

MORE MONEY MUST BE GENERATED within the producing branch of the industry if sufficient funds are to be provided to do the drilling necessary to meet future oil requirements.

That point is being made in an increasing number of studies of the long-range outlook for the domestic industry. And all of them, like the one just published by The Chase Manhattan Bank, necessarily reach the conclusion that the U.S. is "approaching the time when the growth in production will slow."

A detailed study by the bank's petroleum department shows that the possible maximum domestic output by 1966 will be 9.5-million b/d of crude and 1.5-million b/d of natural gas liquids. And even if total U.S. output reaches this 11-million b/d, it will fall short of the anticipated 1966 demand by 3.3-million b/d. In other words, U.S. production would supply only 77% of demand, compared with 90% in 1956.

BUT TO REACH SUCH A RATE of production, the bank estimates that the annual discovery rate will have to average 3.6-billion bbl. annually during the next ten years—which is 15% above the discovery rate of the past ten years. The reasoning is that the U.S. is producing at close to capacity, and that its present reserve producing capacity will be absorbed in the next decade. So half of the increase in production by 1966 will have to be achieved by additional discoveries.

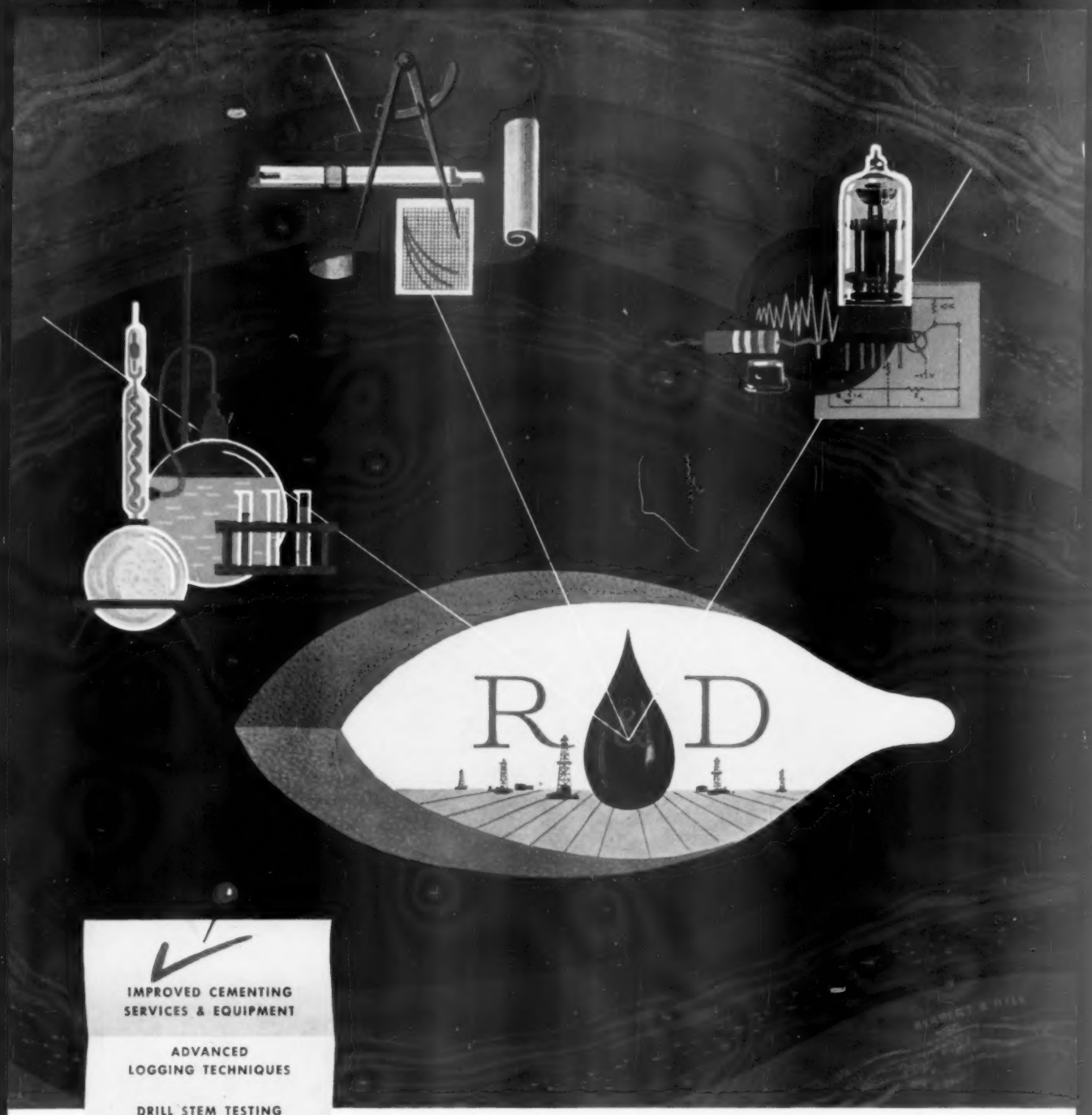
Based on the continued steady decline in reserves found per foot of hole drilled, it is estimated that the industry will have to drill 72,000 new wells in 1961 and 87,000 in 1966 to maintain the needed oil-finding rate.

To do this, the bank says, sufficient funds must be provided from capital formation under a favorable tax and regulatory climate. The estimates show that the wellhead value of liquid hydrocarbons in 1966 will have to be 25% above 1956 if the necessary drilling funds are to be generated.

A 25% boost in wellhead value in ten years certainly is not a spectacular rise. The wellhead value has increased a lot more than that in the past ten years. But costs have increased even faster. The result, as noted both by the Chase study and by a recent one by the cost study committee of the Independent Petroleum Assn. of America, is that the postwar rate of discoveries is inadequate relative to demand.

UNLESS THE PRICE OF CRUDE is realistic enough to encourage the needed step-up in drilling, there is little hope of reaching a production rate of 11-million b/d by 1966.

The cost of finding, developing, and producing oil in the U.S. must be financed primarily out of revenues from domestic production. And unless the proper financing is available, the oil will not be available when we need it.



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